EDITORIAL

BY the way, was not the late Mr. Barnum a resident of Bridgeport for several years?

IT is the high-cost producer that makes the low-cost producer a profiteer. But who would expect the efficient manufacturer to take less than the market price just because he has created conditions that give him an advantage?

PACIFIC COAST yards have completed and delivered to the Emergency Fleet Corporation 1,000,000 tons of vessels, approximately half the total tonnage constructed in the United States since the beginning of the War. Eastern papers please copy.

AN article of particular interest to the men in the metal industries will appear in the November issue. Mr. Fred C. Metcalf, secretary of the California Metal Trades Association, has written for that issue an account of the Association's eleven years experience with collective bargaining. There is, to say the least, a difference of opinion as to whether or not collective bargaining has benefited the employer on the Pacific Coast. As a matter of fact there are some that contend it has been a flat failure from the employer's standpoint. However, Mr. Metcalf is in possession of the facts in the case and is eminently fitted to write upon the subject. His opinion will be awaited with interest.

THE PRESIDENT'S PROCLAMATION

"Every day the great principles for which we are fighting take fresh hold upon our thought and purpose and make it clearer what the end must be and what we must do to achieve it. We now know more certainly than we ever knew before why free men brought the great Nation and Government we love into existence, because it grows clearer and clearer what supreme service it is to be America's privilege to render to the world. The anniversary of the discovery of America must therefore have for us in this fateful year a peculiar and thrilling significance. We should make it a day of ardent re-dedication to the ideals upon which our Government is founded and by which our present heroic tasks are inspired.

"Now, therefore, I, Woodrow Wilson, President of the United States, do appoint Saturday, the 12th day of October, 1918, as Liberty Day. On that day I request the citizens of every community of the United States, city, town, and countryside, to celebrate the discovery of our country in order to stimulate a generous response to the Fourth Liberty Loan. Commemorative addresses, pageants, harvest home festivals or other demonstrations should be arranged for in every neighborhood under the general direction of the Liberty Loan Committee, in co-operation with the United States Bureau of Education and the public school authorities. Let the people's response to the Fourth Liberty Loan express the measure of their devotion to the ideals which have guided the country from its discovery until now, and of their determined purpose to defend them and guarantee their triumph.

"For the purpose of participating in Liberty Day celebrations all employees of the Federal Government throughout the country whose services can be spared may be excused on Saturday, the 12th day of October, for the entire day.

"In witness whereof I have hereunto set my hand and caused the seal of the United States to be affixed.

"Done in the District of Columbia this 19th day of September, in the year of our Lord, one thousand, nine hundred and eighteen, and of the independence of the United States of America the one hundred and forty-third.

"By the President, WOODROW WILSON.
"ROBERT LANSING, Secretary of State."

SIX months ago we were wondering if the Germans could take Paris. Six months from now, the Germans may be wondering, not if we can take Berlin, but how soon we are going to do it.

THE first of a series of articles by Mr. Miner Chipman will appear in the November issue under the general title of 'Wastes of the West.' Mr. Chipman prepared the case of the California Metal Trades Association and the California Foundrymen's Association for presentation before the Macy Board, and was recognized as an authority by the War Labor Board when it called him to Washington to give a first-hand detailed account of his investigations into the labor situation. Before coming to California he represented the Metal Trades Unions at the Watertown Arsenal in their petition to the Secretary of War to abolish the Taylor System of Scientific Management, and at the request of Miss Anne Morgan and others he made a study of the department-stores of New York City, where 35,000 working girls are employed, and formed the basis for the establishment of a school of salesmanship within the stores themselves. The articles will show how labor, resources, time, and opportunity are being wasted in the West, and Mr. Chipman knows whereof he speaks.

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The Fourth Liberty Loan

Any American who does not know the whys and wherefores of the Liberty Loan is in a bad way. It is unthinkable that any reader of this paper especially shall fail in his manifest duty, not merely to take a passive interest in making this Fourth Loan a splendid success, but to put forth every force and energy he possesses to see that every individual within the sphere of his influence does his part to the full limit. Practically every dollar expended in the metal trades is Government money, acquired through the flotation of Liberty Loans and through taxation. Those engaged in the metal trades have a responsibility almost equal to that of our men at the front. The slacker has no place in this community. Roll up your sleeves and sail in. Don't wait until the committee calls, but organize your business force at once. Appoint a committee within your own organization, have a rousing Liberty rally with good speakers, awaken the spirit of enthusiasm among your men, so as to put this Fourth Loan over with such a bang that the noise will be heard in Berlin. There were seventeen million subscribers to the third loan, out of a total population of one hundred million. Seventeen per cent of the people carried the whole load. This will not suffice for the men in the metal trades. One hundred per cent is the slogan; nothing less will suffice. The Hun is on the run. Don't let him slow up at this stage of the game.

Work or Fight

On the twelfth of September, the manpower of the Nation responded to our Country's call, thirteen million strong. There are nearly twenty-five million registrants, not merely for military service, but for whatever work in the interest of the National welfare they may be called upon to perform. This is a big issue, the greatest that has ever confronted the American people, and the true spirit of service and sacrifice must be shown by all hands and the cook, whether in the trenches, the shipyard, or the factory. According to various regulations issued by Provost-Marshal General Crowder, American industry is to be protected against indiscriminate drafts so far as men essential to that industry are concerned, but the employers are placed upon their honor to ask for exemption only for 'key' men, about whom new organizations can be built to replace such men as are required for military service. No blanket exemptions for any special industry are contemplated. Each case must be judged upon its individual merits. Thus a great and patriotic duty rests with the employer. It is up to him to see that the slacker is eliminated, that the shipyards and iron works are not used as an easy way out for the dodger of military service. The man that risks his lily-white hands for a time sufficient to provide himself with a ship-worker's badge only to jump the job when he has received his exemption from the draft board must be smoked out and made to do his bit. The shipyards have sheltered a lot of barbers, bartenders, and other non-producers, who would be of more use in khaki. The employers should help them to achieve this end.

Cupola, Cubelow, or Copula

Here is a chance for the literary gent—what is the real name of that dirty black thing that stands in the foundry and obligingly spouts molten iron about 3:30 every afternoon. Mr. Webster was quite a fellow in his day. He wrote a book called a dictionary, which essays not merely to tell you how to spell words, but what they mean also. He says that the dirty black thing is called a cu'po-la, and that it is also a hemispherical roof, a dome, and also the apex of the cochlea of the internal ear, whatever that means. However, to paraphrase the words of a popular advertisement 'Ask the man who uses it.' The real old-time molder calls it a cu-be-low', and there seems to be real authority back of this version, as the Century dictionary gives cu-po-lo' as an obsolete spelling. It has remained for one of the editors of METAL TRADES to discover a new one which is submitted to the readers strictly on its merits. In discussing the make-up of the Foundry Section of this issue, the old man was asked, "Where do want to put that 'Copula' article?" He staggered for a minute, gasped for breath, and after he came up to the surface asked, "What do you mean, copula?" and nothing short of an actual photograph succeeded in convincing him that it wasn't some surgical instrument, or a new Hun gas-bomb. What's in a name anyway, and a cupola by any other name would smell as much.

Metal Trades and the Chamber of Commerce

War has brought about a sharp line of differentiation between essential and non-essential occupations. It may be stated under ordinary conditions that nothing is non-essential that helps the National welfare, and that the proof of service lies in the support accorded to it. Nevertheless, the whole tendency of governmental control seems toward the use of the shortest route between producer and consumer, and the elimination of as many middle-men as possible. There are two basic industries, agriculture and mining; both of which are dependent upon the conversion of Nature's products to the use of mankind. It is interesting to view the personnel of the San Francisco Chamber of Commerce directorate with these facts in mind. In all, there are but nine directors out of twenty-one that represent basic industries, who are producers, in other words. Of the twelve others, one is a real-estate dealer, one is a banker, one represents a great transportation system, an essential, of course, one is a capitalist, and the rest are merchants, handling products ranging from hardware to tobacco, ladies' clothing to motor cars. Of the total number, but two represent the metal trades.

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Mr. John A. McGregor of the Bethlehem Shipbuilding Corporation, and Mr. Constant Meese, of the Meese & Gottfried Company. The metal trades furnish employment to some 50,000 men about San Francisco bay, and support, directly and indirectly, about 250,000 people, one-third of the entire population. Would it not be well, in the interest of the future welfare of this great industry, to give it better representation?

Unification of Wages

There is one economic accomplishment that seems to be in a fair way to come out of the War, and that is the adoption of uniform wage-scales throughout the United States. Before the War, the whole wage system was badly out of balance. The thickly populated manufacturing districts in the East had wage scales 25 to 50% lower than on the Pacific Coast, and a work day 20 to 30% longer. The Western factory-owner was up against it; he didn't stand a ghost of a chance in competition with his more fortunate Eastern brother. The Fleet Corporation, and the Wage Fixing Boards, confronting the handling of the ship-building and munition program as national issues, are gradually ironing out the inequalities, with the result that when the War is over, the Western manufacturer will stand a better chance to go after the business on a more nearly even footing. There never was any real reason why wages should be lower in the East, outside of that of supply and demand, the East being the dumping ground for European immigrants, most of whom never go far from the Atlantic seaboard. From every physical standpoint, the West is the more attractive locality for the American workman, climatically and in the cost of living. If these facts are brought home to both the workman and the employer, the Western shops will continue to be full of work after the War is over. It takes tonnage to provide work for the men, tonnage to produce low manufacturing costs with which to compete with the other fellow, and more tonnage in order to earn interest on the great investment in tools and equipment.

Settlement of Internal Labor Disputes Without Interference by Walking Delegates

By F. C. Drew

It is perhaps trite to say that the success of every industry must depend upon the co-operation of all connected with it. It is as necessary for the executive end to co-operate heartily with what may be called the manual end, as it is for the manual end to co-operate heartily with the executive end. At present this co-operation is not as it should be in most industries, particularly so where the manual end of the industry is wholly, or almost wholly, operated with organized labor. This is said in no opposition to organized labor as such. Unquestionably, organized labor has accomplished many things that have benefited not only its members, but also the employers and society at large. However, organized labor is not perfect; in fact, it is far from it. It is not 100% efficient, and perhaps is not 50% efficient. Some of its practices are detrimental, and detrimental to no one more than to its own members.

In the settlement of many difficulties between employers and organized labor the so-called settlement is often nothing more than an armed truce. That there is room for improvement in this respect can hardly be questioned. Why is it that settlements are so often unsatisfactory? The employers and employees of many industries each want to do justice to the other, and yet in these very industries neither side is satisfied with the conditions under which they are working. Why? Is it not because disagreements, contentions concerning individual increases in wages, details of changes in conditions, and the many questions over which employers and employees differ, are rarely settled by those directly involved, at least so far as the manual end is concerned? Let a difference arise in any particular establishment where the employees are members of labor unions, and immediately it is taken up by walking delegates, business agents, executive committees, and the like, who represent the entire union, not simply the employees concerned; who know little, if anything, about conditions, operations, or the business of the particular establishment involved, but who are in most instances more the representatives of the employees of rival concerns, of competitors, and perhaps of the business and financial enemies of the establishment involved in the dispute. How much better, how much more satisfactory, and how much more conducive to actual co-operation, harmony, and effective operation it would be if such disputes were settled in each establishment by direct representatives of the executive and the manual ends, chosen from within the concern itself and without interference from the outside. This would in no way interfere with organized labor, for in establishments where the employees are members of unions, settlements could always be made in accordance with the union rules.

Such methods of adjusting difficulties have been successful in many non-union establishments, where wages and conditions are in fact better than in similar closed union establishments, and there seems to be no logical reason why a similar course could not be pursued in establishments where none but union men are employed.

In establishments operated under open-shop conditions questions of all kinds can be adjusted exclusively by the parties involved. Questions concerning the whole of an industry operated by organized labor, in contradistinction to questions concerning individual establishments operating in such industry, would naturally be the subject of discussion and settlement between the union on the one hand and the organization of employers on the other. While, as stated above, the adjustments of internal differences in each establishment, whether it be union or open-shop, should be settled by those who are directly concerned and without outside interference.

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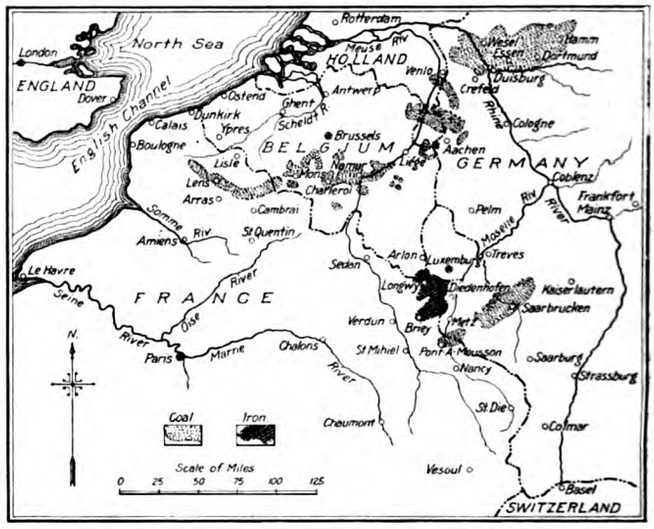
The Iron of Lorraine

An American General of Alsatian origin has achieved a complete victory in French Lorraine. In truth, General Pershing and his troops have started the liberation of a part of France that is of the utmost value, not only in sentiment, but industrially, for in the department of Meurthe-et-Moselle, historically a part of Lorraine, are the great deposits of iron ore essential to the life of French industry. The American troops, after erasing the salient established by the Germans four years ago at St. Mihiel, are approaching Briey, which is at the southern end of the Longwy-Briey iron district. Another less important portion of the Lorraine iron deposits is centred at Nancy, which the Germans have tried repeatedly to win. The tremendous effort made to capture Verdun was prompted, in large part, by the Enemy's desire to obtain a firm grip on the iron resources of France, for not only did the holding of Verdun protect Nancy but it interfered with the German exploitation of the iron ore at Briey, where in 1912 four mines produced 5,600,000 tons of ore, equivalent to about a third of the French production in that year. From the citadel at Verdun, the French have been able to see, at night, the flare of the blast-furnaces in which the invaders have been smelting the ore and obtaining the iron for use in killing the rightful owners of the mines. These metallurgical operations, needless to say, have not been uninterrupted by the French artillery. The cathedral of Rheims has been battered by shells made from iron mined in France. Great is the importunity for driving the despoilers from Lorraine. It is said that, when Bismarck was imposing terms upon France after Sedan, he was advised of the importance of the mineral resources of Lorraine by a German geologist. The ores of the Briey district have a large phosphorous content, and could not be worked to advantage until the invention of the basic bessemer process in 1878. If the process had been known seven years earlier, Germany would probably have demanded this additional territory from France at the close of the war. Indeed, the recovery of Alsace and Lorraine means more to France than appears on the surface. The return of the people and the soil of the lost provinces is the recognized prize of victory to France, but underneath the surface is a great industrial treasure, the famous deposit of 'minette,' an iron ore that is comparatively low-grade, averaging only 35%, but existing in a deposit so big and so shallow that it can be mined cheaply. The ore-zone is 8 miles wide, 40 miles long, and as much as 60 feet thick. In 1913 the Longwy-Briey basin yielded 15,147,000 tons of the total French production of 21,700,000 tons. In the same year the part of Lorraine taken from France in 1871 gave the Enemy 21,136,000 tons out of her total production of 28,600,000 tons. The deposits extend also into Luxemburg, which, in 1913, produced 7,333,000 tons, making a total of 43,616,000 tons mined in this region as a whole, the equivalent of 13,800,000 tons of iron. When the lost provinces are regained, the French production of iron ore will increase to 43,000,000 tons, while that of Germany will decline to 7,500,000 tons. Before the War, according to the statistics of 1912, there was exported 4,673,000 tons of 'minette' ore to Belgium and 2,798,000 to Germany. The scarcity of coking-coal, needed for smelting the iron ore, compelled this exportation, in return for imports of coal from German Westphalia and from Belgium. The output of the Valenciennes coalfield is not as suitable for smelting the ore. Hence in time of peace there was a mutual exchange of raw materials between France, Germany, Belgium, and Luxemburg, a friendly co-operation of which the Germans took advantage in order to obtain the information that they needed for their predatory campaign. It is no wonder that a German writer, Dr. J. Reichert, of Berlin, in an article appearing in the December 1917 issue of the 'Weltwirtschaft,' explains: "The occupation and exploitation of the Briey-Longwy deposits saved us in this



MAP OF THE WESTERN BATTLE-AREA, SHOWING THE IRON DEPOSITS OF LORRAINE AND THE COALFIELDS OF FRANCE, BELGIUM, AND WESTPHALIA. THE FIGHTING-LINE IS NOT MARKED BECAUSE IT CHANGES SO RAPIDLY FROM DAY TO DAY.

War. We live and breathe because we are able to defend our country and our life with the iron of Lorraine"; to which a French commentator, M. Henri Hauser, probably of Alsatian origin, now of the University of Dijon, replies: "Briey and Longwy—this is for Germany the means of re-making her fortune when peace is restored; this also is the means for preparing for—or not having to fear—the next war. That is why M. de Schoen, in 1914, was told to demand Toul and Verdun from us. That is why the Crown Prince hurled his army against Souville and Douaumont. That is why Germany will defend Briey to the very end." And, shall we not add, that is why the American army under Pershing will continue to crumple the German lines until the invaders are driven from the blast-furnaces at Briey, when their fires, re-lighted by French hands, shall flare in the night like the dawn of a new day, when the soil of Lorraine and all that lies beneath shall be delivered from the hands of the despoiler, and returned, with joyous acclaim, to our gallant Ally. *Chaque homme a deux patries, la sienne et la France!*

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Metal Trades

The Trade Journal as a Factor in Creating More and Better Business

MANUFACTURING success is predicated upon two major factors, good goods and good publicity. Either one without the other is like a man with one leg; he can get around after a fashion, but he cannot win any race.

The manufacturers of the West need make no apologies for their product, especially now that the performance of Pacific Coast shipyards, backed by the foundries, machine-shops, and forge-shops have made a record that has set a new mark for the rest of the world. The problem of today is not to get orders, but to get men and material in sufficient quantity to meet the unprecedented demand for everything they can turn out.

The duration of this condition is measured by the length of the War. It is a wise man indeed who can guess how long that will be, nevertheless it will end some day, and the events of the past weeks are at least comforting in the assurance that the initiative on the Western battle front has been wrested from the Hun, and that final and conclusive victory seems nearer than at any time since August 1914.

The end of the War will signal a return to peace-time business conditions. The fight to get labor and materials will change to the fight to get orders. The time seems propitious for the establishment of a periodical that will be truly representative of Western metal trades, to work for the perpetuation of the industries that have sprung into existence through war-time demands.

The tens of millions invested in shipyards, foundries, machine-shops, forge-shops, and manufacturing establishments in the West, have grown to hundreds of millions in a few years.

This same condition applies with equal force to the whole of industrial America. The employment of new capital has been extraordinary, and this new capital must be made to produce and earn after the war demand has ceased, or present the pathetic picture of dusty buildings, cold smoke-stacks, and rusty tarpaulin-covered machine tools.

Middle-Western and Eastern plants are better organized than those of the West, so far as selling is concerned. Favored by Nature through sources of material-supply within easy proximity of their factories, and the further advantage of a lower wage-scale and longer hours of labor, they have been able to manufacture at costs so much lower than those in the West that the handicap of transcontinental freight cost was easily overcome and the Western manufacturer was undersold in his own backyard through the introduction of goods made three thousand miles distant.

The emergencies of war-times are likely to change some of these conditions at least for the duration of the War. There is little likelihood of a reversion to the wage and hour scales of the pre-war period, after peace is declared. Recessions are rare indeed. The cost of living goes up merrily, but rarely, if ever, goes down.

A uniform wage and hour scale for the American workman is in process of making. This will overcome the former handicap of the Western manufacturer as far as labor is concerned. Again, the better working conditions existing here during all seasons of the year will give the Western metal trades a decided advantage. As far as raw materials are concerned, the Eastern source of supply will be available by water carriage through the Panama Canal, while the excellent Chinese pig formerly used to such good effect in Western foundries will again become available. The scarcity of scrap is serious, but not insurmountable, and the initiative of the Western manufacturer will not fail him in case this emergency should arise.

Take it all in all, the Western metal trades have a good fighting chance, perhaps a better chance than many realize, if they will go after the one essential element without which there can be no manufacturing at all, and that is volume of business.

METAL TRADES offers itself and all of the energies at its command to help achieve this end. Selling is a problem in itself, separate and distinct from that of manufacturing, although the two are so closely interrelated that superiority in either is not sufficient alone. First, the goods must be made, and second, they must be sold, in fact, frequently the order is reversed, selling becoming the first process.

Selling is a three-cornered problem, the basis of which is advertising. Selling and advertising are synonymous. There is the personal salesman, the genial young man with his bright sunny smile, his price book, and his expense account; there are the circular letter and the catalogue, and there is the trade journal. No one of these is sufficient unto itself. All three together produce low selling cost, without all of them, the volume of trade that spells success cannot be produced.

The trade journal does a lot of things toward the accomplishment of this end. It keeps the reader in touch with improvements in manufacturing methods; it publishes stories of his accomplishments, the goods he manufactures, and their use; it distributes these data among those who are interested in his product, whether they are dealers, jobbers, engineers who make specifications, or consumers; its advertising section gives descriptions of

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apparatus available for the readers' use and benefit, and, at the same time, conveys news of the progress made and what is offered for sale. Thus the buyer is interested to the extent of beginning direct correspondence with the advertiser. The salesman meets those who have already become interested in the goods through the agency of the trade journal. If the journal is efficiently conducted, the manufactured product is introduced cheaply and effectively; the work of following up inquiries and prospects is done with a minimum of time and money waste; dealer and agency representation is secured without difficulty, and the first real steps toward securing the vital volume of trade have been successfully taken.

This is what METAL TRADES proposed to do for the manufacturers of the West, and, with the help and cooperation of the manufacturer himself, can and will become a real factor in the perpetuation of the Western factory. Due entirely to lack of proper advertising, there are almost no manufactured articles from Western factories known by brand, trade-name, or otherwise. Before the War, nearly all Western shops were content to do a puttering sort of jobbing business, making small repairs, filling orders for local consumption, and except for the mining machinery business, allowing orders for goods in bulk to go to the Eastern manufacturer.

METAL TRADES will help to change this condition; devote all of its time between now and the end of the War and forever after that to the up-building of Western manufacturing; to carry the word of the excellence and variety of the product of Western factories to those who need enlightenment on this score; to point out new products that can be manufactured in the West to advantage; in short, to become part and parcel of the metal trades in the West as an organ of publicity through which the output of Western factories may find their way into the markets of the world.

A Model Letter of Application

THE following letter was received by a corporation with offices 'somewhere in California.' With the exception of a few necessary deletions by the censor, it is printed exactly as written:

Dear Sirs:

Did you declare and pay a dividend on your stock in August?

Six shares are held in trust for me in the City Bank and Trust Company of * * *

I wish I knew so as to keep track of my income. The six shares were part of the inheritance I received from my mother's estate. She left me one third of her property in trust.

Concerning another matter I would like to ask you for a job. I do not drink a drop of alcohol in any form. I do not use tobacco in any form and I usually as a rule tell the exact truth believing it will serve me best and make for my happiness here on earth anyway. I am a little over 50 years old, a year or two only. I have a work shop at * * * street which is the main street of * * * . I do repair work, sissors and knife grinding, lawn mower sharpening etc. and am just making expenses. I have a high ability in dealing with women. For years I dealt with them in Los Angeles. I do not want a hard manual labor job. I am fluent and convincing and can say the right thing at the right moment in a difficult situation in dealing with women.

Long years ago my job was in Philadelphia and it was calling on dissatisfied customers listening to their grievances and mending matters so as to keep their business.

I am a fat man weigh 245 lbs. and am six feet tall so that I am not so fat as if I was only 5 feet tall and weighed the same, 245 lbs.

I believe that as the draft is taking no doubt many of your men you might give me a job. Would not however care about hard manual labor. My ability lies in sobriety, absence of the nickertine smell and the alcohol smell, and I have a bath every day. To women who do not use tobacco or drink, the smell of a tobacco user and mild drinker is a horrible thing and there are few men who are not very disagreeable to women in the odor of their vices.

Being perfectly bathed daily and no taint of tobacco, alcohol or other indulgences about me, I am an agreeable surprise and have won a strong point at the start in dealing with ladies. I am telling of my ability now is why I write the above. Women always notice it and often speak of it. 'Why you do not use tobacco, do you?' 'No its rather nice isn't it to see a man once in a while that doesn't use it.' I can disarm the most violent anger against the firm I work for, if the anger is entertained by a woman customer, and often by men customers too. My method is simple enough too, I arrive my natural unstimulated self, I am at ease, unabashed and in real sympathy. I listen with real interest and get into the attitude of mind of the engered one. Then I adroitly commence to plan a remedy, and get the angry one to suggest the remedy we always use any way in that case, and I take my departure, leaving the formerly angry one a firm friend of my company, or boss, or myself, or what the blank it doesn't matter I win the good will back O. K.

Do you want me?

(Signed) X.

"ARE you a machinist?" asked the foreman.

"No, aye bain Lutheran," said the Swede.

"No, I mean can you run a machine?"

"Oh, yes; aye run thrashin' machine for two years in Minnesota."

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A NEW CALIFORNIA SHIPYARD

By W. W. Hanscom

SHIPYARDS are springing up almost overnight. The haste incident to the great emergency of War would indicate that careful attention to detail in design might be sacrificed to speed. The author shows clearly that this is not necessarily so, as is proved by the new yards of the Pacific Coast Shipbuilding Co. This plant, one of the newest Western shipbuilding enterprises, has already made a remarkable record for performance, affording a fine tribute to the executive ability of the management, and the skill of those entrusted with the design and construction of the yard.

THE Pacific Coast Shipbuilding Company's yard is situated on Suisun bay about 35 miles from San Francisco. The site comprises 233 acres of hard adobe clay, fairly level and with a water frontage of 2800 ft. and a depth of 27 ft., partly fresh and partly salt at certain stages of the tide. The present development covers about 45 acres and includes about 1500 ft. of the waterfront; the remainder of 188 acres and 1300 ft. of waterfront forms ample reserve for future developments. Grade was established at 8 ft. above mean low-water, thus furnishing plenty of material from the high ground for filling in the lower.

The general lay-out of the plant is in the form of a rectangle, two groups of buildings and the ways being arranged on either side of a main roadway 120 ft. wide and extending practically east and west. The plate shop, blacksmith shop, tin, carpenter, and electric shops, warehouse, and office, in the order named, starting from the westerly end, are situated on the southerly side and the ways, power-house, and machine shop are on the northerly side. Back of the plate shop are the storage racks served by the spur-track and a large electrically-operated gantry crane. East of the machine shop is the fitting-out dock equipped with 40-ton shear-legs and is also served by a spur-track. All of the buildings are of heavy mill-construction, with the exception of the office, and all have been designed to have an abundance of natural daylight.

The plate shop is 390 ft. long, 80 ft. wide, with a second story 300 ft. long for the mold loft. The blacksmith shop is a one-story building, 108 by 50 ft. The tin, carpenter, and electric shops are in one building of two stories, 100 ft. long and 50 ft. wide. The warehouse is of two stories, 121 ft. long and 50 ft. wide, with a concrete loading platform 18 ft. wide, served by one of the spur-tracks. Provision has been made for an increase of length when required. The office-building is of two stories, 113 ft. long by 49 ft. wide. The first floor is occupied by the executive and general offices and the second by the drafting rooms and blue-printing department.

Steam-heat by direct radiation is provided throughout. A central branch exchange provides telephonic communication throughout the yard and over the Bell Telephone Co. lines. The power-house is 96 ft. long and 55 ft. 6 in. wide and contains the main switchboard, air-compressors, fire and service pumps. The machine shop is 198 ft. long and 111 ft. wide with provision for extension to 400 ft. It has three bays, the centre being 50 ft. and the two side-bays 30½ ft. each. The centre and north bays are each traversed by overhead electric cranes, the former of 15 tons capacity and the latter, 5 tons. A planing mill and pattern shop, 150 ft. by 70 ft., one story in height is in line with and to the south of the warehouse. Outside the present grounds are a restaurant, two bungalows of one story each, a rooming house of two stories, and three cottages, for the use of employees. In addition to the

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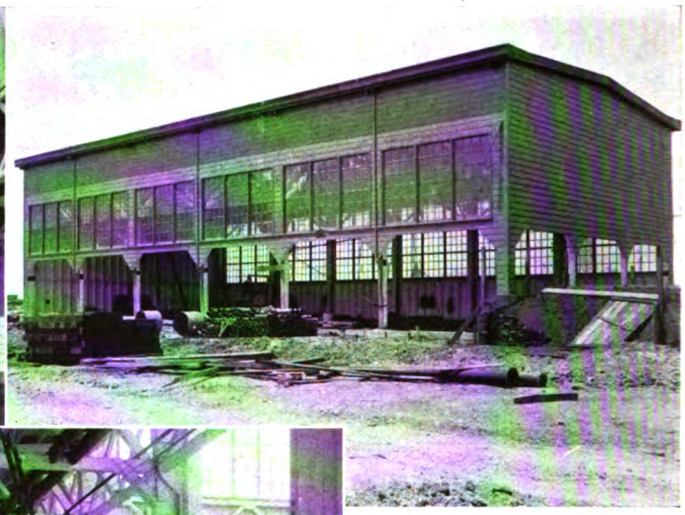
MACHINE-SHOP



BLACKSMITH-SHOP

SOUTH-WEST CORNER OF MACHINE-SHOP

above buildings are a few smaller ones for miscellaneous storage, stables, and templates.

Spur-tracks parallel the southerly buildings on both sides, enter the machine shop, and terminate at the end of the fitting-out dock. An underground oil-storage tank provides fuel-oil for the locomotive cranes, blacksmith shop boiler, and rivet-heating forges. An extensive system of roadways has been laid out and partly completed, including one over half a mile long connecting with the highway. Working-spaces surrounding the buildings have been macadamized with broken rock and slag from a nearby copper-smelter.

To provide for flood-water during the winter an extensive system of underground drains has been constructed as well as a sanitary sewer system. Both systems discharge into the bay. Ample toilet facilities have been provided as well as a complete independent system for drinking water and water for lavatory purposes, and supplied from a separate tank fed from wells. The ordinary service-water used for fire, watering, and testing purposes is pumped from the bay and distributed from the main gravity tank or from the pumps direct.

At present, free transportation between San Francisco and way stations to the yards is furnished by a special train making the round trip daily, for those employees living along the line of the Southern Pacific railroad.

The central position of the power house, parallel with and practically in the centre of the building-ways, facilitates the economical distribution of power and compressed air.

When the yard was being laid out and constructed, the condition of the material market made it necessary to co-ordinate the designs with the materials available. Cement and lumber for the construction of the buildings and foundations were comparatively easy to procure, steel work offered some difficulties, but machinery, motors, conveying apparatus, heavy copper and steel cables could be obtained only from Eastern factories. Deliveries were notoriously slow. Delays were anticipated as far as possible by placing orders as soon as material lists could be prepared and by following up shipments and routings constantly.

Because of the desire of the owners to get started on the construction of 10 cargo vessels of a net dead-weight capacity of 9400 long tons each, and an equally intense desire on the part of the construction force to make a record and at the same time deliver a first-class plant with a liberal reserve for future contingencies, splendid progress was made and six months after breaking ground the plant was completed and the keels laid for four vessels. Some delay was experienced on account of the scarcity of good labor, failure of promised deliveries of materials and the rainy days which converted the clayey soil into seas of mud, which could be dried only by evaporation. However, none of the difficulties proved unsurmountable and by the tenth of March the plate shop was completed, machinery installed, and the first plate was punched. Progress was rapid from this time. On May 1, the first keel was laid, to be followed by others in rapid succession, the fourth having been laid on July 6.

The nature of the soil made it possible to use reinforced concrete for the building-blocks on the ways. These are arranged in a series of transverse concrete beams, spaced

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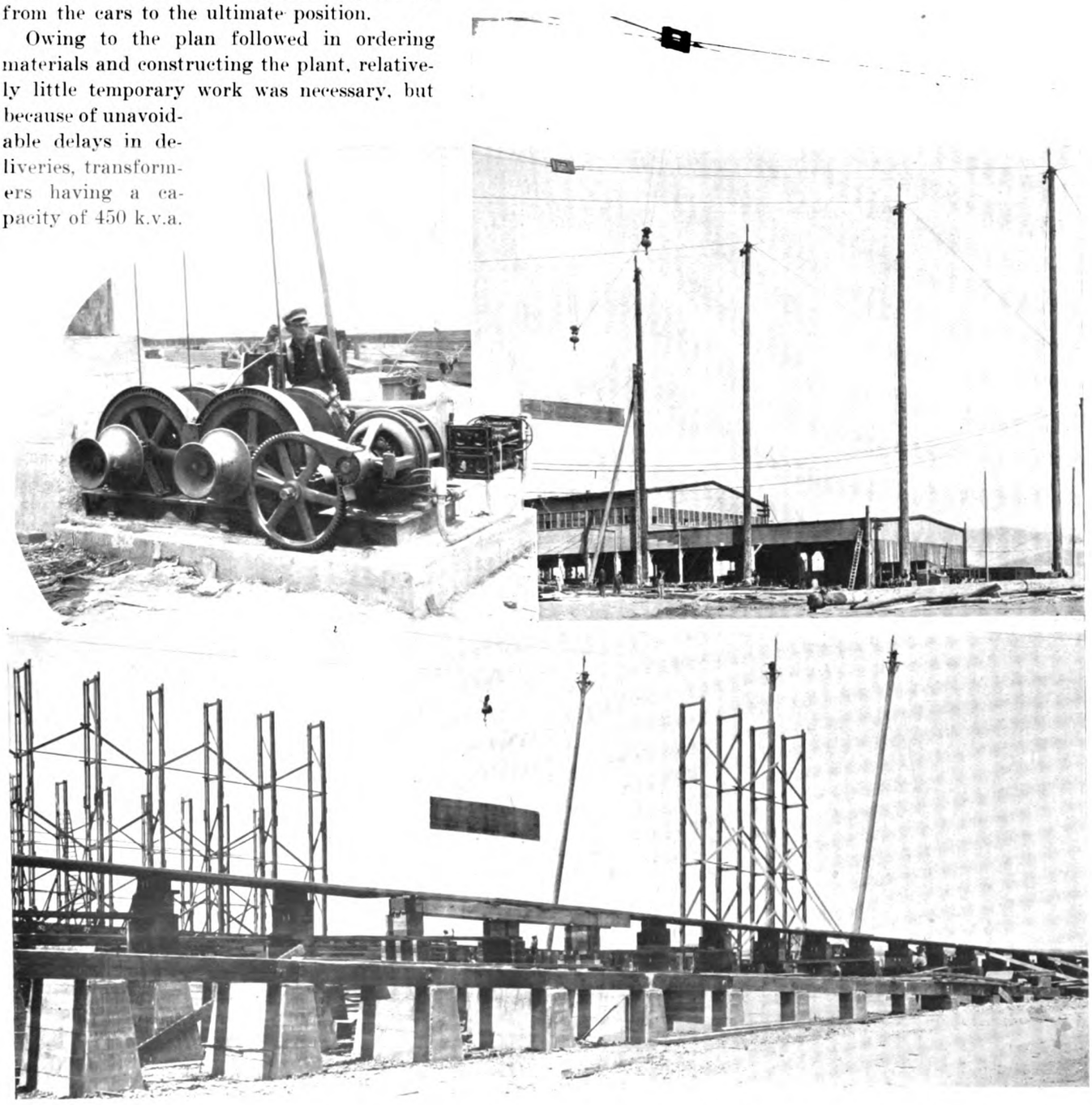
8 ft. centre to centre for 70% of the length of the ways or nearly to the water-line, and tied together by 12 by 12 in. Oregon pine timbers.

The general layout provides for seven ways, of which four are completed. They lie slightly north-east and south-west with the inboard ends about 200 ft. from the front of the plate shop, thus allowing ample space for setting up. A large working space on pile foundations has been built outboard of each way to facilitate construction of the sterns.

Each way is served by two aerial tramways with 1¾-in. steel cable supported on 115-ft. masts. Raw materials follow a straight and continuous pathway from the cars to the ultimate position.

Owing to the plan followed in ordering materials and constructing the plant, relatively little temporary work was necessary, but because of unavoidable delays in deliveries, transformers having a capacity of 450 k.v.a. and an air-compressor of 565 cu. ft. capacity driven by a 100-hp. motor were temporarily installed.

Power-plant. As the entire installation depends upon electric power for its operation, special care was taken in the power-plant lay-out to forestall any possible interruption, with the exception of main-line trouble, beyond the company's control. Electric power is obtained from the Great Western Power Co. as 3-phase, 60-cycle, 22,000-volt current and is received over a branch line 6000 ft. long built by them for the company. The lines enter the property at about the centre, following the railroad spur-track, swing around at the north



UPPER LEFT-HAND CORNER—HOISTING-GEAR FOR AERIAL TRAMWAY. UPPER RIGHT-HAND CORNER—TERMINAL TOWERS FOR AERIAL TRAMWAY. BELOW—WAYS, SHOWING REINFORCED CONCRETE KEEL-BLOCKS AND TRAMWAY DEPOSITING SHIP-PLATE

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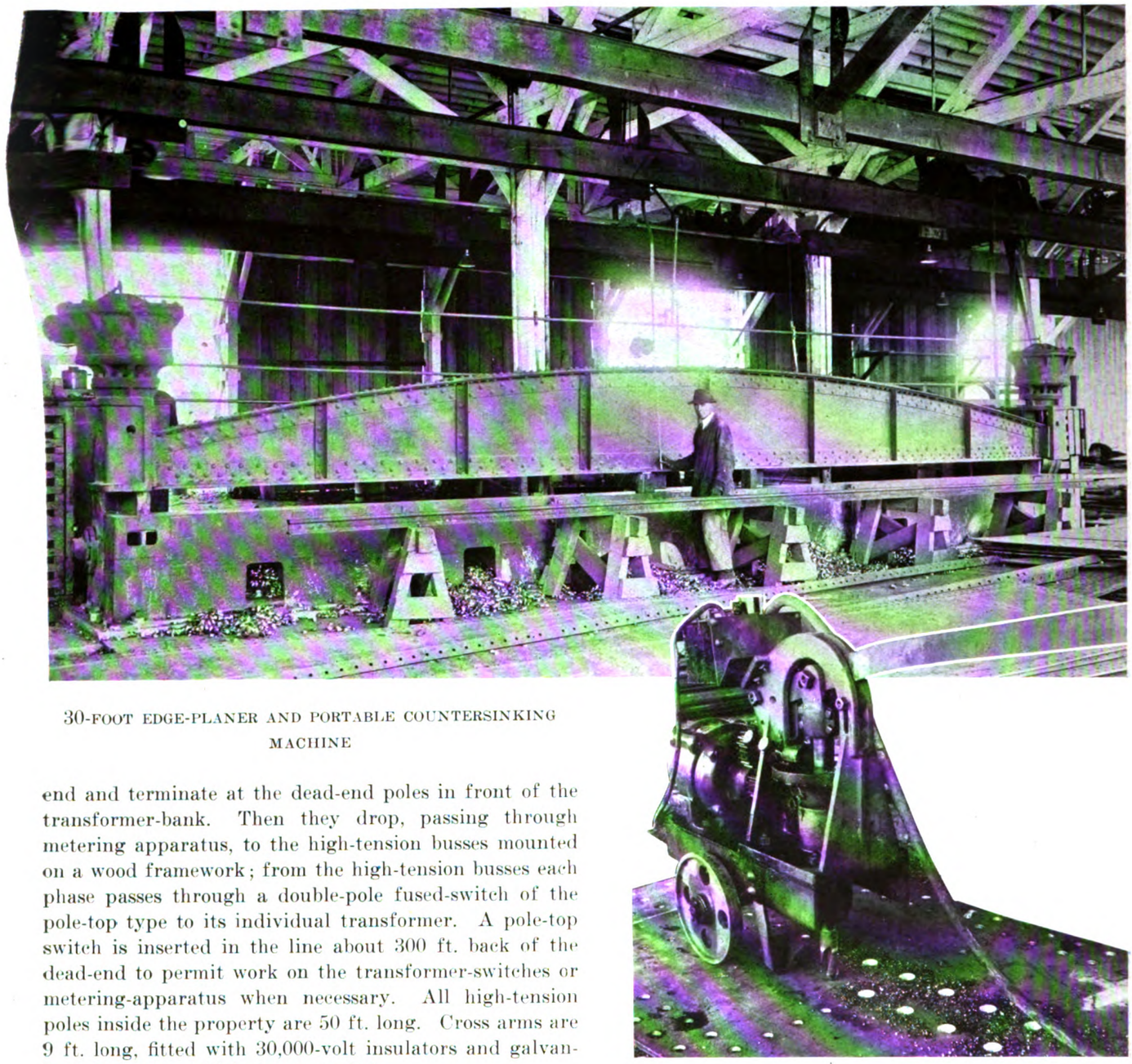

30-FOOT EDGE-PLANER AND PORTABLE COUNTERSINKING MACHINE

end and terminate at the dead-end poles in front of the transformer-bank. Then they drop, passing through metering apparatus, to the high-tension busses mounted on a wood framework; from the high-tension busses each phase passes through a double-pole fused-switch of the pole-top type to its individual transformer. A pole-top switch is inserted in the line about 300 ft. back of the dead-end to permit work on the transformer-switches or metering-apparatus when necessary. All high-tension poles inside the property are 50 ft. long. Cross arms are 9 ft. long, fitted with 30,000-volt insulators and galvanized-steel pins, which are grounded.

The transformer-bank consists of 3 single-phase, 667 k.v.a. Packard transformers, 22,000 volts primary, 480/240 volts secondary, oil-insulated and air-cooled, of the outdoor type. They rest upon a concrete foundation, each in a separate pit 12 in. deep and having a large trapped drain connecting directly with the underground sewer discharging into the bay. Considerable space is allowed around each transformer to permit a free circulation of the air. The drain system is also extended by means of a separate connection from each transformer-case drain-cock, extended underground to a common main, back of the fire-wall, and into which it connects through a valve. The common main is provided with two valved-connections one of which connects to the sewer and the other to a terminal by means of which the oil in any transformer may be renewed, tested, or drained in case of fire.

The transformers are set 14 ft. 6 in. from the south wall of the power-house, in a fenced yard, and are isolated from the power-house by a reinforced concrete fire-wall set half way between and extending 3 ft. above the tops of the transformers. The ends of the fire-wall taper from nothing at the top to 7 ft. at the bottom, ending on a line with the transformer-backs. The above arrangement effectually protects the power-house in case of accident to the transformers, and makes it possible easily and rapidly to dispose of the oil in case of necessity. Each transformer contains approximately 1100 gal. of oil.

All high-tension wiring and apparatus is out of doors, well guarded and protected, and each transformer is individually controlled on both high and low-tension sides. Sufficient space has been provided for the removal of each transformer should it become necessary to make repairs. Three secondary-leads from each transformer

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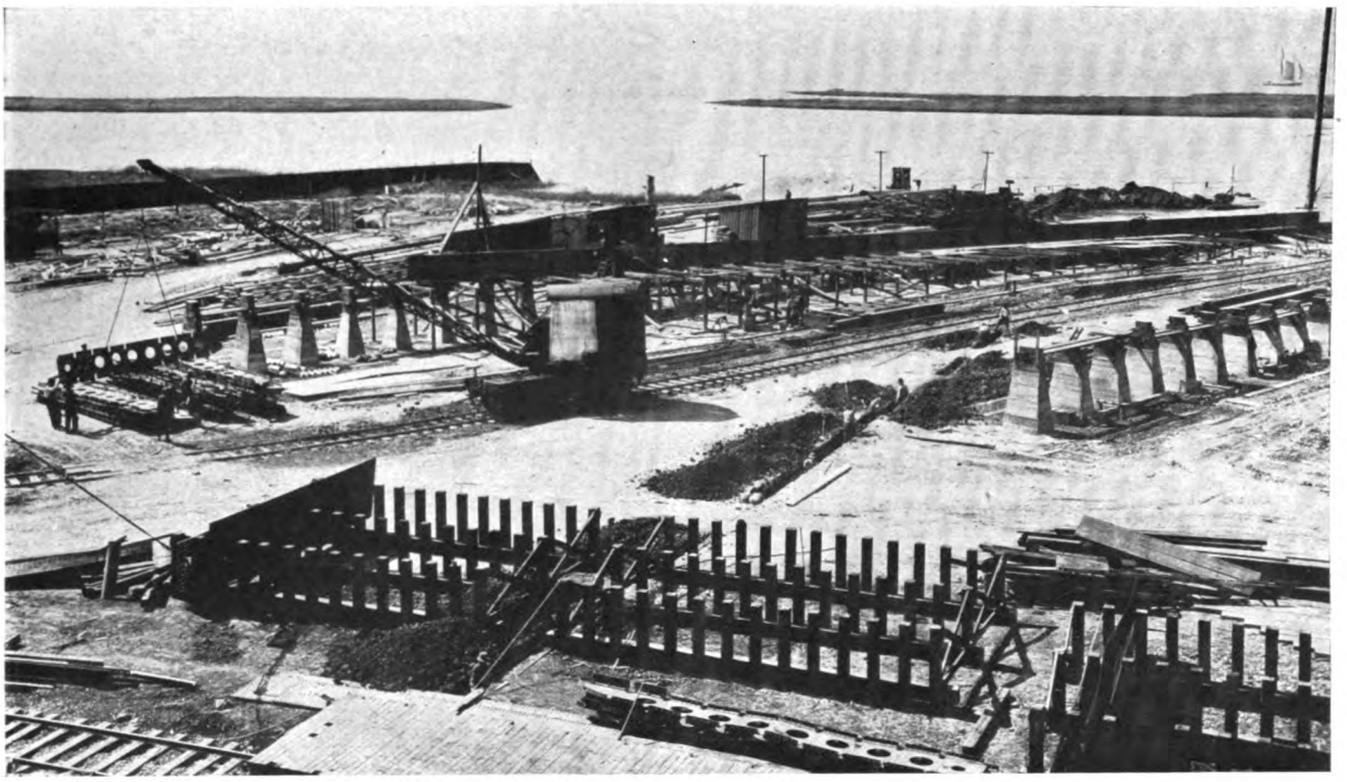

GENERAL VIEW OF WAYS No. 4 AND 5

pass through the fire-wall and south end of the power-house and terminate in 1500-ampere triple-pole oil-switches, each on a separate panel and forming the centre of the main board, which is 7 ft. high, 29 ft. long, and is set 7 ft. from the wall, to allow for the installation of the compensators and switching apparatus. Controlling panels for the air-compressors and distributing panels for the feeders are evenly spaced each side of the main switch-panels. Two sets of busses for 480 or 220 volts extend the length of the board and connect through oil-switches to the feeders, each oil-switch being fitted with under-voltage and over-load protection.

Separate feeders are run to the plate-shop, yard gantry, and aerial-tramway hoists, machine-shop, planing mill, fitting-out dock, and ways. Each feeder terminates in one or more distributing panels from which the individual motor-circuits are run through fused switches. In general the distributing panels are mounted on elevated platforms of sufficient size to give plenty of operating room all around and are made easily accessible by permanent ladders. This arrangement prevents accidental contact while handling materials and permits the space to be used for other purposes. Each platform is provided with storage for spare lamps, fuses, and supplies. All feeders with the exception of those under the ways and part of the feeder to the fitting-out dock, are run overhead on well-constructed pole-lines of sufficient height to clear locomotive-crane booms and other obstructions. The feeders terminate at the power-house on a dead-end rack and are then carried down in conduit to the back of the board and opposite the switches to which they connect, the entire lay-out being such as to eliminate the necessity of crossing or transposing.

From the pole-lines, the feeders enter the building in conduit to a service-switch and the large sizes continue to the distributing panels on cleats with strain-insulators and bolts at the ends to keep them taut; small sizes are run entirely in conduit. With the exception of the office, warehouse, bungalows and cottages, all wires are installed in rigid steel conduit. All power is distributed at 480 volts, three-phase, and motors are of the squirrel-cage or wound-rotor type depending upon their use; except those for driving the air-compressors, which are synchronous. Punches and other machines having heavy fly-wheels and requiring 7½ hp. or less are driven by high starting-torque motors thrown directly on the line. Constant-speed machines requiring 7½ hp. or more are driven by standard induction-motors and started by compensators. Adjustable variable-speed motors of the wound-rotor type with slip-rings and fitted with drum-controllers are used on all cranes, hoists, rolls, and gantrys.

The general standard speed for motors is 1200 r.p.m. This is reduced in special cases where the size of the motor is above 25 hp. or when the form of drive requires a lower speed, such as for direct-connected air-compressors operating at 200 and 164 r.p.m. With but few exceptions, such as for group-drive for small machines or where the application would not permit, all motors drive through gear reductions. All locally operated switches are of the enclosed externally operated type. For supplying portable grinders, counter-sinking machines, and other small portable power-driven devices

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steel-encased switches have been provided with wing-nut terminals so placed as to cover the field of operations with a 50-ft. portable-cord connection. The cables are wrapped with extra heavy weather-proofed braid or else the conductors are enclosed in heavy rubber hose, depending upon the use. Power for use on the ships during construction is supplied by an underground conductor carried through a series of distributing cabinets, one on each side of each ways so that the branch circuits will not have to cross and be in the way of construction. In each of the steel cabinets is a slate panel-board with a main switch, transformer-switch, and two feeder-switches. The cabinets are at the centre of the length of the ways and under the wooden staging to which the branch circuits are secured in ordinary open construction. The transformer-switch controls the primary of the lighting transformer. Air-compressor motors are of the synchronous type and at present have a total capacity of 1800 hp., with future provision for 1200 hp. additional. Both fire and service pumps and air-compressor plant are in the power-house.

Cranes and Hoists. Structural materials are unloaded direct from the cars by a gantry-crane 3½ tons capacity. The span is 140 ft. and the gauge 33 ft. The crane overhangs the spur-track on one end and reaches to the plate-shop on the south side. Between the gantry-tracks are the storage-racks, and between the tracks and the plate-shop are the laying-out yards where the plates are laid out and marked. The present travel of the gantry is 600 ft. with provision for future extensions of more than double that distance. The gantry is fitted with a 75-hp. bridge-travel motor, a 25-hp. hoist-motor, and a 15-hp. trolley-motor, all of the wound-rotor type with drum-controllers handled from the operator's cab. Rail-girders have been constructed for future installation of an under-running single-leg gantry to serve the laying-out yard. In addition a number of jib-cranes, supported from the columns of the plate-shop, serve the small local section.

The north side of the plate-shop is fitted with a number of 30-ft. jib-cranes spaced 45 ft. centre to centre to serve the entire space in front, which is used as a setting-up yard. Provision has also been made for a single-leg gantry to serve this section. Inside the plate-shop, on each side, there are two overhead rails carrying a number of 8-ft. gauge, 2-ton trolleys for serving the punches and other tools which are arranged along the centre for the entire length of the shop. Push-cars on standard-gauge rails are used to transfer material from one side to the other and into the yards. A 3-ton, mono-rail, electric trolley completely encircles the plate-shop inside, looping around the ends. The bending-slabs are in the south-east corner with the heating furnace just outside the easterly end. Shapes are unloaded by the gantry or locomotive cranes upon a space east of the plate-racks where they are laid out and marked for future operations. The gantry is fitted with a number of high candle-power tungsten lamps in enameled steel reflectors for use in night work and so situated as to light much of the surrounding territory. Energy is supplied from a small transformer in the control-cab.

In the machine-shop a 15-ton overhead traveling-crane serves the 46-ft. centre bay. This crane is fitted with a 30-hp. hoist, a 22-hp. bridge, and a 5-hp. trolley. All of the motors are of the slip-ring type operated from the cab by drum-controllers. A similar crane of 5 tons capacity serves the north bay. It is fitted with a 22-hp. hoist, 15-hp. bridge, and 3-hp. trolley motor. In this bay are the small tools and pipe-threading machines. For general service around the yards there are three locomotive cranes, two 15 tons capacity and fitted with 50-ft. booms, the third being 10 tons capacity and fitted with a 30-ft. boom. All are steam-operated with fuel-oil burners.

Each of the building-ways is served by two aerial tram-

3½-ton cantilever gantry

ways consisting of 1¾-in. steel cables, one on either side, supported by wooden masts 115 ft. high at the outboard and inboard ends. The cables are anchored to massive concrete piers on the shore-end and to pile-dolphins on the water-end with provision for taking up slack at the former. Each cable is equipped with a trolley carrying a two-part hoist, one end of which is secured to the outboard-mast while the other end passes over a guide-sheave at the shore-end and down to the hoisting-drum at the base of the mast. The inboard-masts are in line with the north front of the plate-shop. The distance between pairs of masts varies from 612 to 650 ft. A clutch-driven drum at the hoist operates the trolley movement, both trolley and hoist movements being controlled by the same motor. Both trolleys over a ways can be operated separately or as a unit, the hooks in the latter case being strapped together. By a proper manipulation of the two trolleys and hoists, materials can be landed at any point of the ways. The entire space between the plate-shop and the outboard-end of the ways is thus served by the aerial tramways with a single handling of the materials.

Motors of the wound-rotor type, fitted with drum-controllers and developing 22 hp., are mounted on a common bed-plate with the hoisting and racking mechanism, and these are in turn set on concrete foundations and

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housed for protection. Each hoisting engine has also an extended shaft fitted with a gypsy-head for auxiliary service. The designs for the aerial tramways were based on a maximum stress of 8 tons on the centre of the cable with a 25-ft. sag.

On the fitting-out dock the handling of machinery, boilers, and other materials will be taken care of by shear-legs of 40-ton capacity built up of two wooden masts, each 145 ft. long, lashed together at the top and braced by a back-leg with a cross-head at the lower end. The dock piling is reinforced in the way of the shear-legs bearings, and heavy sockets are provided for the lower ends of the masts. A 12-part steel-cable hoisting gear is operated by a 50-hp. motor while two 10-hp. motor-driven winches will handle the racking. Both winches are controlled from the same point and each is fitted with an auxiliary gypsy-head. A special pawl and ratchet gear is also provided for locking the winding-drums in position. Each of the winches operates through a 6-part tackle fitted with steel cable, the lower block being anchored to the dock and leading from there to the winch-drum, fitted with a hand-operated band-brake.

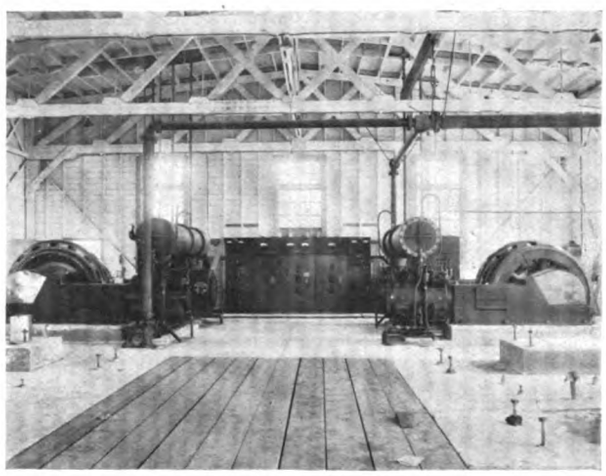
Compressed-Air System. The compressed-air system of a steel shipyard requires a large part of the total power consumption. Unless great care is taken in the design, installation, and operation, a good deal of the power consumed is wasted. A feature of the present installation is the central position of the compressor-plant, which permits a straight lead for the main from the power-house to and under the centre of the building-ways in succession. At each side of each ways a 4-in. vertical riser with stop-valve feeds the horizontal branches and manifolds, which are placed on the permanent construction-staging at different levels as the progress of the ships requires.

The main air-line comprises 300 ft. of 12-in. pipe and 400 ft. of 10-in. pipe, this length serving the entire ways-section. A 4-in. branch serves the setting-up yard and plate-shop and a similar line extends from the power-house to the fitting-out dock, and another to the machine-shop. Underground lines are placed in 2-in. redwood trenches, graded to drain. They are provided with expansion-rollers to take care of the movement due to temperature changes. With the exception of some connections to the sectionalizing valves, all joints in the air-lines are gas-welded. A working pressure of 100 lb. per sq. in. is maintained, one compressor being adjusted to care automatically for the variation in demand. Great care was taken in the installation of the manifolds, valves, and hose-couplings to reduce leakage to a minimum under the most severe service-conditions.

The compressor-plant consists of four units with space for two additional. All units are cross-compound with large inter-coolers and are direct driven by synchronous motors mounted on the crank-shafts. Two units have a net free-air capacity of 1500 cu. ft. per minute each, were built by the Bury Compressor Co. and are driven by Electric Machinery Co.'s motors at 200 r.p.m. The other two units, built by the Nagle Corliss Engine Works, have a net free-air capacity of 3000 cu. ft. per minute and are driven at 164 r.p.m. by General Electric motors.

Direct-current exciters, belt-driven from fly-wheels on the shafts, furnish the energy for the motor-fields. Each motor has a control-panel incorporated as a part of the main switchboard and is fitted with the usual starting-switches, ammeters, field-rheostats, and pilot-lights. Space has been provided for two additional 600-hp. units when the demands require them. Cooling-water for the cylinders and intercoolers is taken from the service mainfold which draws its supply from the gravity-tank or from either of the pumps direct. The discharge-water is returned to the settling or receiving-tank to be pumped again into the system.

The use of synchronous motors having a power-factor



SOUTH END OF POWER-HOUSE

of unity and forming such a large proportion of the total load of the plant has a beneficial effect upon the power-factor of the plant as a whole. Placing the compressors adjacent to the main switchboard and power-supply reduces the copper required for power-transmission to a minimum. It requires the use of the 60% voltage-taps for starting the compressors when fully unloaded. A temporary compressor having a capacity of 565 cu. ft. per minute was first installed at the far side of way No. 5. It is belt-driven by a 100-hp. induction-motor. It is used as a reserve and for special service.

Fire-Protection System

Since the plant is isolated from outside assistance in case of fire, special effort was directed toward making the fire-protection system adequate to cope with any emergency. No expense was spared to make the installation complete in every respect.

With an abundance of nearly fresh water available from the bay, it was necessary to provide means for separating the solid materials carried by the tides and other currents. In deep water and some distance from the shore-line an intake-screen was placed 24 sq. ft. in area and of comparatively fine mesh to separate the larger particles. From this screen a 16-in. intake-pipe extends to a reinforced concrete settling and discharge-tank 20

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PANORAMIC VIEW OF PACIFIC COAST SHIPBUILDING CO. YARD JUST SIX MONTHS AFTER GROUND WAS BROKEN. THE TION, IT WAS COMPLETED IN 40 DAYS. THE NEXT LARGE BUILDING ON THE RIGHT IS THE BLACKSMITH-SHOP. IT

ft. diam. and 14 ft. deep situated under the main gravity-tank. The intake is provided with a gate outside the tank and a check-valve inside to prevent the return of the water at low tide. The size of the tank permits the settlement of the larger portions of the fine suspended matter which are collected in a sump and pumped out as required. The fire and service pumps each have an independent suction and the relief-valve drains return any waste to the tank.

Above the settling-tank and supported on a steel tower 95 ft. above grade is the 50,000-gal. gravity tank with two outlets, one 8 in. at the bottom for supplying the fire-main and another set at the 35,000-gal. level for supplying the general service-lines, this latter being 6 in. diam. and used also as the main filling-pipe. The fire-pump is of the centrifugal type, has a capacity of 750 gal. per minute under 100 lb. per sq. in. pressure and is driven by a 75-hp. motor controlled either automatically or by hand. The general service-pump is also of the centrifugal type, has a capacity of 700 gal. per minute under 160-ft. head and is direct-driven by a 50-hp. motor controlled either automatically or by hand. The valve arrangement provides for either pump being used to fill the gravity-tank or to discharge into the fire-main, or else the fire-pump can discharge into the fire-main while the service-pump is used for filling the tank. Provision is also made for the installation of an additional fire-pump, gas-engine driven, so that entire dependence will not be placed on the electric-power supply.

The underground system comprises about 6000 ft. of 6-in. and 8-in. heavy cast-iron, bell-and-spigot pipe laid at an average depth of 30 in., and forming a complete rectangular loop encircling the buildings and ways. The centres of the long sides of the loop are tied together by an 8-in. main into which the fire-pump and gravity-tank discharge direct. From the loop, dead-end branches extend to some of the hydrants outside. Fittings have been installed so that additional loops can be connected as additions are made to the yard. Sectionalizing valves permit shutting off any part of the loop in case of damage or repairs, but under ordinary conditions any hydrant can be supplied through a double line of mains.

Double 2½-in. hydrants are spaced at an average distance of 150 ft. and each fitted with a double length of 2½-in. hose with 1⅛-in. play-pipes. Each of the main buildings is equipped with 1½-in. hand-hose outfits so spaced as to reach any part with a 50-ft. length of hose, and in addition numerous Pyrene extinguishers are mounted at easily accessible places. A 40-gal. chemical fire-engine is also included and a constant patrol of the grounds by watchmen maintained. The completed installation will include automatic fire-extinguishers in the plate shop, warehouse, power-house, planing mill, and pattern shop, and in the machine-shop. An 8-in. main extends from the loop to and along the fitting-out dock where are four double-nozzle hydrants similar to those around the grounds.

Electric Lighting

For lighting the buildings and grounds, the yard has been divided into a number of sections each supplied by a single-phase transformer of 37.5 kw. capacity, 480 volts primary and 240/120 volts secondary, mounted on a pole in the centre of distribution and fed by a separate circuit controlled at the power-house. The transformers are of the pole type, oil-insulated and air-cooled and feed into the secondary mains, which are run on the poles with branch services leading to the different buildings, where they pass through service-switches before continuing to the panel-boards for final distribution to the lamps. With the exception of the executive offices, the lighting units consist of nitrogen-filled tungsten lamps enclosed in steel reflectors either porcelain-enameled where exposed to moisture or dirt, or with aluminized finish in the general offices and the mold-loft. In the manufacturing departments, the spacing and height of the lamps is such as to

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BUILDING ON THE EXTREME LEFT, NEXT TO THE CANTILEVER GANTRY, IS THE PLATE-SHOP. INCLUDING THE FOUNDA- WAS BUILT IN 12 DAYS. THE NEXT BUILDING, WITH THE COMPANY'S NAME ACROSS THE TOP, IS THE MACHINE-SHOP.

insure a generous and uniform illumination without the use of local lighting except in special instances, and also to be above the possibility of damage by careless handling of materials.

Cut-out cabinets are located in convenient places and the subdivision of the circuits is such as to give localized control over relatively small areas by push-button switches therein. All reflectors are of the deep-bowl type and the resulting illumination has proved remarkably satisfactory and free from glare. In the shops where bench or fine tool-work is being done a liberal installation of wall-receptacles provides for local lighting when required. In the clerical offices and drafting rooms the location and spacing of the lighting units is such as to provide an approximation of the natural light from the windows so that no change of position will be required when using the artificial light. In the blue-printing department there is an electric printing-machine of the continuous type fitted with six enclosed arcs operating on 220-volt alternating current.

All open-work circuits with the exception of those in the warehouse and in the mold loft are installed in galvanized-steel conduit. In the offices the concealed work is knob-and-tube and in the warehouse and mold loft, on knobs and cleats. All cut-outs, switches, outlets, and controlling-devices are installed in steel cabinets and boxes. A large variable amount of lighting is required on the ships during construction before and after launching, and special arrangements have been made by installing a separate set of feeders running underground and through the centres of the lengths of the ways with distributing and controlling-cabinets at each side of each ways. Alternate cabinets are arranged to be supplied from transformers situated below them and receiving energy from the 480-volt underground power-feeders through the power-cabinets previously described.

By a suitable arrangement of the secondary mains which loop through all the distributing-cabinets, all of them can be supplied by one or more of the transformers or each can be supplied by its own transformer should the load-conditions require it; or practically any combination can be made by operating the transformers in multiple or singly on different sections. The arrangement is intended to facilitate the economical installation and operation of apparatus to care for an uncertain and variable demand which will depend upon the amount of night work. The standard transformer-unit is 37.5 kw. and can be moved easily to any desired position. Each distributing panel has six 30-ampere, three-pole branch switches for controlling circuits to the various parts of the ships or ways. The entire system is flexible and is divided into units of such size as to minimize interruption to the work in case of trouble. It has proved satisfactory in actual service.

General lighting of the grounds is done with 500 and 1000-watt nitrogen-filled lamps fitted with reflectors and band-refractors and suspended from the poles or corners of the buildings at an average height of 40 ft. The various circuits are fed from the section-transformers and are operated by remote-control switches controlled from a central point.

The results achieved have been made possible by the splendid spirit of co-operation existing among the various branches engaged, including the owners, constructors, architect, engineers, and material-men. The general supervision was under the direct charge of John T. Scott, vice-president and works manager. The design of the buildings and lay-out of grounds was handled by Frederick H. Meyer, architect, who also had charge of the general construction. The Lindgren Co. was the general contractor. I had charge of the design and installation of the electric, fire-protection, and compressed-air systems. Frank Small, mechanical superintendent, had charge of all the mechanical installation.

(Note.—All photographs accompanying this article were taken by C. G. Robinson.)

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A LETTER FROM THE FRONT

Somewhere in France,
July 20, 1918

RECENTLY I received an order attaching me for duty to the famous Guards division of the British army. I have been with them until yesterday, when I returned here, where I am to be for about three months attending the General Staff College.

I hardly know how to begin to tell you of my experience with the Guards. It all seems so like a fairy tale. The mere fact that of all the divisions in the British army I should draw the Guards is a wonderful bit of luck in itself. Within a very few hours after receiving my order, I was on my way, and though I had what we would consider a relatively short distance to go, it took me nearly 36 hours to get there (it should have taken about six), but traveling in the actual war-zone is very slow, unless one is moving with troops. However, the journey was intensely interesting, because it was through a part of France where some of the most furiously fought battles of the War have taken place. A British brigadier who had fought all over that section was traveling in the compartment with me, and he fortunately was willing to talk, and gave me most interesting information about what had taken place, and how the tide of battle had ebbed and flowed over the very ground we were slowly proceeding across. Oh, the desolation and wanton destruction! It can't be described. One wanted to weep and swear at the same time—it is so pathetic and so hellish. As a result, every time I saw a Boche (and I did see hundreds of them, thank God) I wanted to kick him in the face if he had any left—many of them didn't—or violate his infernal carcass in some other way. Really, you cannot actually hate until you have been through this thing, and for your own sake I hope you never will, for it puts a streak of iron in one's soul that civilized human beings should never have. There is a bitterness engendered in man that must have an unpleasant and everlasting influence upon my life, no matter how short or how long that life may last. But I must not dwell on that. By the time I had reached my destination I had received a first-hand impression and understanding of the War as it has been, and as it is, far more vivid than I ever hoped or expected to have.

Upon reporting to the Chief of Staff, I was cordially received, and it being about lunch time, I was taken to the Major-General's mess, of which I was to be a guest while at division headquarters. Well, I wish you could have seen that meal, or more properly, could have eaten it. Instantly I thought of you and our mess at McAllen—it was so damned different. There we were within artillery fire of the German front line, we could distinctly hear the roar of the guns, yet the meal served and the manner of serving it would compare quite favorably with M's best effort, and that is going some. But this is not a panegyric on food. I merely mention it to show how wonderfully they do things after four years of hellish war. The Major-General is a man whose name you would recognize at once, but I must not mention it. He has a string of initials a yard long after his name, but be seemed really interested in questioning me about myself, our army and what they expected of us, and altogether was perfectly charming. He directed his A. D. C. personally to see to my billet and that of my 'servant,' and this suggests a subject about which one could write at length, for the servants in the British army are real artists. The one assigned to me was named Macgregor, so you can judge which one of the Guard regiments he came from. He was a wonder, and seemed to anticipate my every wish. Wherever I went to spend the night, even in the front line, he went too, packed and unpacked my stuff, and saw to its transportation. Ye gods! what luxury not to have to depend upon a 'detail' whose fingers are all thumbs, to do such things, and then finally have to do it oneself. I was to have the billet of a colonel who was going on leave, the next day after my arrival, so, after many apologies, I had to occupy for one night a heap of debris that had once been a fine room, but a 12-inch shell had taken a few liberties with it, and about the only accommodation it offered was protection against rain, provided it came down straight and not too hard. It was cold as blazes, but my man made me quite comfortable for the night. Next morning, however, it was hell. I heard him fussing around about 7:30 and watched, when he was not looking, to see what he was doing. Imagine my horror when I saw him bring in a large collapsible tub and start to fill it with water. Ugh! finally, after much formality, he informed me "Your bath is ready, Sir," and there was nothing for me to do but get up and stand in the damned thing while he poured petrol-tins full of water over me. Really, I deserve the V. C. for that, yet I would rather have been shot on the spot than to have hesitated, for Macgregor would have considered himself disgraced for life if 'my officer' had shown himself to be such a weakling. No matter what the future has in store for me, it cannot be more trying than that bath or require more courage to face. Macgregor decided what I should wear, made me change my clothes for dinner every night, even in a front-line dug-out, and in about two days had all my leather stuff so I could see my face in it. They are great sticklers for that, as you probably know, and although the mud in the trenches outside was knee-deep, you were expected to have immaculate boots when you first stepped into it upon leaving your dug-out. Of course the Guards are noted for their 'swank,' but it seems incredible that they could carry it so far, and how it does make for discipline! Our ideas are really absurd,

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compared to the perfection to which they have developed it. I never believed such soldiering was possible, and with it all there is the most wonderful camaraderie between all ranks. Each officer is called by his first name, or more commonly by some queer nickname, that is, all except the General Officers and C. Os. The consideration shown to the enlisted men by the officers surprised me most of all; there is always an unbridgeable gulf, yet no one had too much rank to say 'Thank you' and 'If you please.'

After two days at division headquarters, studying the tactical position, I went to the front line and spent 36 hours in a company headquarters, then two days and nights at battalion headquarters, finally getting back to brigade headquarters for three days and nights. The distance from the Boche front line ranged from 40 yards, while in the front line, to about 1000 yards when in the brigade headquarters. All the time, of course, I was living in various dug-outs. I expected to find things a bit rougher when I left division headquarters to go nearer the front, but not at all. The same delightful formality prevailed, and the dinner I had within fifty yards of the Hun line consisted of five courses, beautifully cooked and served, with Scotch, port, three liqueurs, and beer to select from. I had my tub and shaved every morning, polished boots, and clothes cleaned of all vestige of mud awaiting me. Now, don't think I am romancing in the least. I know it seems impossible, but upon my word, I really am moderating my description for fear you may think I am just lying. The answer is simply this: these chaps have been in this war so long that it has become a matter of routine with them. Their service of supply is the most wonderful organization I have ever seen. Nothing is ever late in arriving, and there is no scarcity, but no waste. Every man has his job, does it, and never knocks the other fellow. The Brigade Commander, with whom I spent three days, is a lord—has the V. C., D. S. O., and numerous other initials after his name—yet if some of our people should see him dawdling over his dinner and sipping his port afterward, wearing a monocle the while, they might think he was a typical silly-ass stage Englishman; but believe me, folks, that chap is the real thing in the soldier game. I unhesitatingly admit that during the first few days of my stay in the trenches, I was scared green, and any man who says he isn't is a liar. No trench or dug-out seemed deep enough to suit me during those first few days, and when on the second day the Boche dropped a 'minnie' that must have been as large as the dome on the capitol at Washington plunk into the trench about thirty yards from me, and the dirt and stones began to rattle down like hail on my tin hat, I was quite ready to call off the war right there and return to the Armory warfare of Thursday-night drills, where the most dangerous thing is one of Tom Anderson's delayed-action fuse sub-calibre cartridges down in the range. However, one has to get used to such things, and in a few days, I was walking about the trenches, standing up to the full height of my 68 inches.

A little bit of everything happened while I was there. I now know what it is to go 'over the top,' stumble over a dead Boche, and fall into a mass of barbed wire. I have been sniped at, a target for machine-guns, and helped dig up one poor fellow from a shell-crater whose entire body below his chest was blown away. One of my prize possessions is a Boche bullet that knocked my stick from my hand, but did no further damage. The infernal thing is dum-dumed too, as I shall show you if I have the good fortune ever to be back. A new trench-coat that I bought in Paris just a few days before was so badly eaten up by the liquid from a gas-shell that exploded near me that I had to throw the thing away. They also pulled off a raid while I was in the line and brought back three Huns. Only one man of the raiding party was hurt. They brought him back, as they always do, but I fear the poor chap has died, as he was shot through the stomach.

I know that all this seems like fiction, but every word of it is true, for one cannot exaggerate anything about this war. Thousands of similar things are happening to thousands of men up there every day, but no one thinks anything about it. It is quite as natural to them as is your daily routine at home to you, or anyone else. Of course, happening to me, some one you know, it may seem impossible, but unfortunately it is not. We have just such things ahead of us for our daily routine until this hellish war is over.

My work here is to be intensely interesting, and by all odds the most difficult I have ever attempted. The class consists of 116 officers, with a great preponderance of colonels and lieutenant-colonels. I am the only National Guard officer in my section, and as about only one in five of the previous class qualified, you can imagine what I have ahead of me. Unfortunately, there is a strong prejudice against N. G. officers, which makes it just that much harder for me, but the goal I have set for myself is to be among the first ten at the finish, prejudice or no prejudice, for that is the honor group, and Company I would never stand for a piker.

The town here is wonderfully interesting, one of the oldest in France and more closely associated with early Roman history than the French. When I was struggling through Caesar's 'Commentaries,' I was trying to read a lot about this place and its associations with his numerous scraps with the Gauls. God knows, I hope I make a better showing in my present studies than I did then, for I never could get Latin through my head.

WHISTLER once undertook to get a fellow artist's work into the autumn salon. He succeeded, and the picture was hung. But the painter, going to see his masterpiece with Whistler on varnishing day, uttered an exclamation of dismay.

"Good heaven!" he cried, "you're exhibiting my picture upside down."

"Hush!" said Whistler. "The committee refused it the other way."—Boston Transcript.

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BUILT-IN GUARDS FOR MACHINERY

By JOHN R. BROWNELL

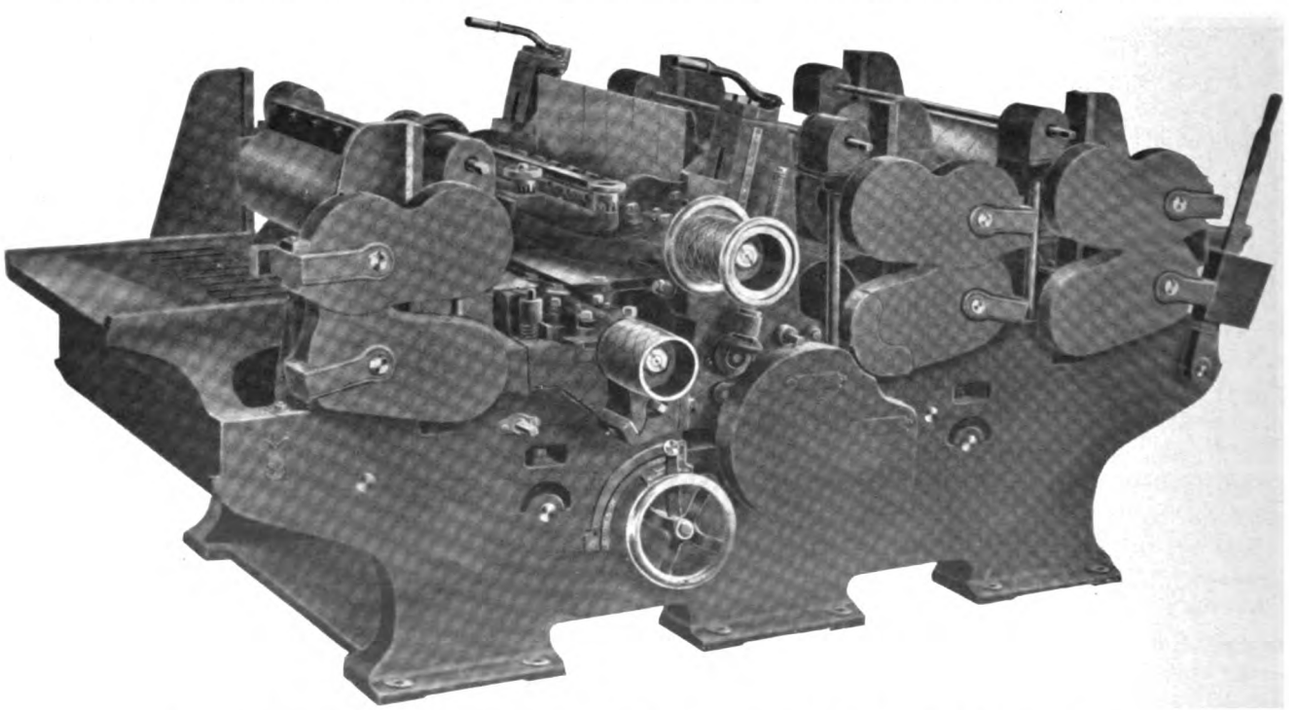
'Safety first' is no longer a subject for argument. Everybody admits it. Users of machinery are not only willing but anxious to comply with safety regulations. In this article the Superintendent of Safety for the Industrial Accident Commission of California shows that it is cheaper and better in every way to have safety devices, as far as possible, specified in advance and placed on machinery by the manufacturer rather than added in a makeshift manner by the user after it comes from the factory.

WHEN the Workmen's Compensation, Insurance, and Safety Act went into effect January 1, 1914, little had been accomplished in California in the way of machinery safeguards. Consequently, as the Safety Department of the Industrial Accident Commission developed its requirements for the protection of workmen in industry, it was necessary to provide thousands of guards for gears, belts, pulleys, etc., and either to cover protruding setscrews on revolving parts, or replace them with some safety countersunk type. The result has been that guards of all sorts have been made and installed, often at an expense which has perhaps seemed out of proportion to the safety provided. Then arose the question of why the machine-manufacturer had not provided necessary guards. The answer was simple enough and was two-fold: first, the guards were not specified by the purchaser, and, second, they would have added to the cost of the machine. There have been, however, an increasingly large number of machine-manufacturers who, either of their own volition, or because of the specifications of purchasers, have been equipping their output with full protection to the operators.

Under the stress of war-conditions we should not lose sight of the fact that the success of our army overseas is dependent in large measure upon the industrial production at home, and that conservation of the lives and limbs of our workmen as well as of food, is important. Every reasonable mechanical safeguard ought, therefore, to be provided for the protection of the industrial army.

There is also, generally speaking, a decided economy where machine-guarding is provided by the maker, especially where machines are manufactured in quantity. From a safety standpoint, the 'pre-guarded' machine is preferable to one guarded after installation, in that the operator is not nearly so liable to omit the guard if it has been incorporated in the manufacture.

The representative of a large manufacturing concern wrote to the National Safety Council, in Chicago, as follows: "When we install new machinery it must be gone over very carefully by our safety engineer to see that it



WELL-GUARDED SIX-ROLL DOUBLE SURFACER FOR PLANING-MILLS AND BOX-FACTORIES

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complies with the safety rules of the plant and the laws of the State. Formerly this was done only after the machinery had been purchased and was ready for operation in the plant. Very often it cost a good deal of money to install the protecting devices necessary to safe operation, so I gave orders that all contracts must cover Safety as well as operating requirements."

The General Safety Orders, issued by the California Industrial Accident Commission, in connection with machinery safeguards are as follows:

Order 1. Gears

1. All gears, where exposed to contact, must be entirely enclosed, or equipped with side-flanges extending inward beyond the root of the teeth.

2. All spoke-gears and open web gears, which are over 18 in. diam., where exposed to contact, must be entirely enclosed. On large gears, such as those on heavy shears and punches, the guard must be such as to cover them to a height of 7 ft. above the floor.

3. Where it is clearly impracticable to cover gears, as described above, a boxed frame of metal or wood must be installed, completely shutting off the machinery-gears.

4. All gear-guards must be kept in place while the machinery is in operation.

Order 2. Belts

1. All belts, ropes, or chains driving machinery or shafting, and all secondary belts, ropes, or chains where exposed to contact, must be guarded. In all cases where the belt, rope, or chain runs onto the pulley, sheave, or sprocket, if within 7 ft. of the floor or platform, must be guarded.

Exception: Belts which are so small or so slow moving that they are not in any way a source of danger.

2. All horizontal belts, ropes, or chains driving machinery or shafting, 7 ft. or less above the floor or platform, where exposed to contact, must be guarded. All overhead belts 6 in. or more in width and over 7 ft. from floor or platform, must be guarded underneath and on sides, unless so guarded that persons cannot pass under them. All chain or rope drives over 7 ft. from floor or platform must be guarded in like manner to belts over 6 inches in width. In all cases the guard should cover the outer faces of the two pulleys or sheaves and extend upward to such a point, and be attached in such a way, that in case the belt, chain, or rope breaks, the guard will withstand the whipping force.

3. Vertical and inclined belts must be substantially guarded as follows:

First, if the guard must be less than 15 in. from the belt, with a complete enclosure of wood or metal to a height of 6 ft. above the floor.

Second, if the guard can be placed with at least 15 in. clearance from the belt, with a two-rail railing at least 3½ ft. high.[1]

Order 3. Pulleys

1. Pulleys must be so placed as to allow the width of the belt between two pulleys, or between the pulley and the shaft hanger or bearing, or a hook must be provided, or a guard placed adjacent to the pulley to prevent the belt from leaving the pulley.

2. All machines must be equipped with a loose pulley or a clutch or some other adequate means of stopping the machine quickly.

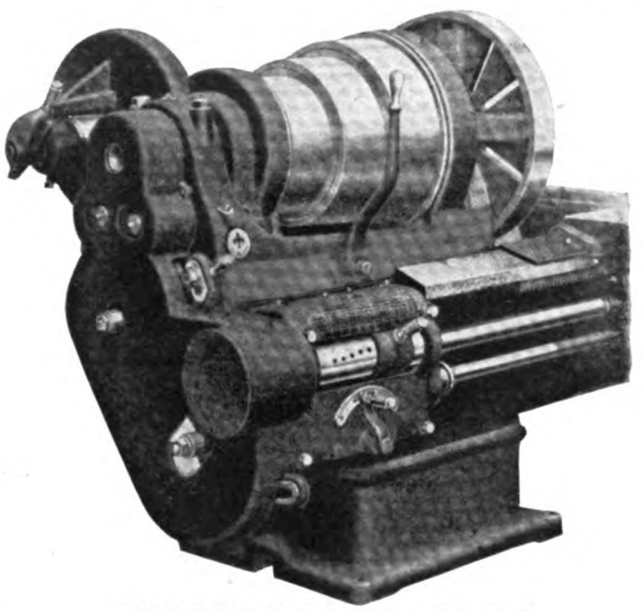
3. All pulleys or parts of pulleys within 7 ft. of the floor must be guarded, if exposed to contact.

Order 4. Clutches

All clutches must be completely guarded where exposed.[2]

Order 5. Belt-Shifters

1. A permanent belt-shifter must be provided for all loose pulleys, and must be located within easy reach of the operator. The construction of belt-shifters must be such as to make it impossible for the belt to creep back onto the tight pulley. All belt-shifters must be equipped with a lock or some other device to prevent accidental shifting.



WELL-GUARDED END-GEARS OF LATHE

Order 6. Shafting

1. All transmission-shafting, either horizontal or vertical, in workrooms or in passageways leading to workrooms, and located within 7 ft. of the floor or platform, must be guarded.

2. Dead-ends of shafts less than 7 ft. from the floor or platform, or wherever exposed to contact, must be guarded.

[1] In rooms, or parts of rooms, used exclusively for transmission-machinery, such as ground-floor of sawmills and the basements of paper-mills or flour-mills, it has been found practical to define certain passageways for the use of oilers and millwrights, and to guard the pulleys, belts, and shafts along these passageways.

[2] Practically all clutches have protruding parts, which make them as dangerous as projecting set-screws on shafting.

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ORDER 7. SET-SCREWS

All projecting set-screws on moving parts must be removed, countersunk, or protected by a solid collar, or a headless set-screw must be used. No part of the set-screw must project above the surface.

ORDER 8. SPROCKETS

All sprockets must be guarded, if exposed.

ORDER 9. FLYWHEELS

(This applies to flywheels of machines and not to flywheels of engines, which must be guarded in accordance with Safety Orders for Stationary Engines.)

All parts of flywheels with spokes, which are 7 ft. or less above the floor, must be guarded as follows:

1. If guard is at least 15 inches in the clear from both sides and face of wheel, a fence may be used at least 3½ ft. high, to be either solid or of substantially supported wire mesh or close slats.

2. If guard is less than 15 inches in the clear from both sides and face of wheel, a fence must be provided at least 5 ft. high, the fencing to be either solid or of substantially supported wire-mesh or close slats.

Exception: Flywheels which are so small, or so slow moving that they are not in any way a source of danger.

3. All flywheel-pits must be surrounded with a toeboard not less than 6 inches in height.

ORDER 10. GRINDING-WHEELS

1. Where practicable, grinding-wheels must be provided with a hooded guard of sufficient strength to withstand the shock of a bursting wheel. This guard must be adjusted close to the wheel and extend forward over the top of the wheel to a point at least 30° beyond a vertical line drawn through the centre of the wheel.

2. Arbor-ends must be guarded.

3. Speed of wheels must not exceed the speed recommended by the manufacturer.

4. Where practicable, grinding-wheels must be provided with safety-flanges.[3]

While many of the above requirements cannot be readily incorporated in the manufacture of machines, it is nevertheless true that in a large measure machines can be fully equipped by the manufacturer to conform with these standards.

During the year 1916, machinery-hazards in the State of California caused accidental injuries to 7659 workmen, the severity of the injuries being distributed as follows: Fatal, 53; permanent, 703; temporary, 6903. Without considering the actual money loss to the employers in compensation and in medical and surgical costs due to the injuries noted, it becomes apparent that the loss in life and limb from the machinery hazard is altogether too large, and that every reasonable means should be employed to reduce this terrible loss in man power. It is earnestly to be hoped that manufacturers of machinery will devote their attention to safeguarding all their machinery output and that purchasers will include in their specifications that all machinery must be guarded in accordance with the laws of the State and in accordance with their particular needs.

[3]Wheels should be handled with the greatest care in unpacking, storing, delivering, etc., and should never be left standing on the ground or wet places. Great care should be used in mounting wheels; never force a wheel on the arbor. It is advisable to use relieved flanges, compressible washers between wheel and flange, and to obtain a perfect bearing at the outer edge of the flange. Vibration should be avoided at all times.

Safe Buildings and a State Building Code

By J. J. ROSEDALE

MUCH has been written about accident prevention in industries, but little attention has been given to the necessity for passing rigid building laws and for enforcing them by systematic inspections. Thousands of lives and millions of dollars have been lost because of unsafe buildings. Every municipality should have an adequate building code and a building inspection department whose duty should be to check all plans before beginning the alteration or construction of buildings and to inspect such work during erection.

Since January 1914, when the Workmen's Compensation, Insurance, and Safety Act went into effect in California, it has been required that all places of employment, indoors or outdoors, above or below ground, should be made safe. The Department of Safety of the Industrial Accident Commission has engaged in a vigorous campaign to carry out the provisions of this act. The first year, the Safety Department with its small force of men made an investigation of the hazards in the construction field and in other industries throughout the State. In March 1915, the Commission appointed a construction engineer whose duty has been to inspect construction work and make recommendations for the safety of employees, and also to investigate accidents that occur during the progress of construction. In September 1915 another construction engineer was appointed to take charge of the construction field in the southern part of the State, making his headquarters in Los Angeles.

Recently a four-story brick building collapsed in a Middle Western city, killing 39, and injuring 40 persons.

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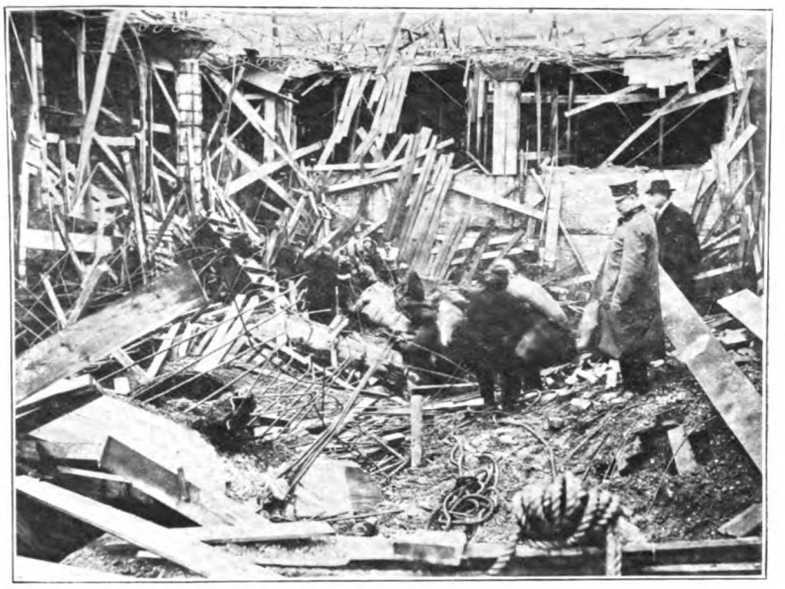
The weakening of the dividing wall between the adjoining buildings is believed to have caused the initial failure at the first floor line. The adjoining building was completely crushed by the falling walls and a fire broke out immediately, accompanied by several explosions.

A report of an investigation made by the local Engineers' Club was submitted to the coroner's jury. The evidence showed that the walls of the building had been in a bad condition for several years, as the brick showed much deterioration and signs of crumbling. The mortar and brick were of inferior quality and developed numerous cracks in the walls. About ten years ago the buildings destroyed were considerably weakened by cutting the first-floor joists, by lowering of the first floor, and by removing the wall-anchors of the joists. Just before the collapse the fourth floor was overloaded, causing it to sag considerably. There was no adequate inspection of the building at the time the permit for remodeling was under consideration. The building inspection department accepted the word of an employee of the owner of the building, as to the nature of work to be done and the condition of the building, but no plans or specifications accompanied the application for the permit, although this was required by the city ordinance. The representative of the city inspection department made only a casual personal inspection. There was no examination of the walls, materials, the condition of the floors, the temporary supports, or the loads carried on the various floors.



VIEW OF COLLAPSED BUILDING

Such accidents show that there is urgent need for a better class of building construction for the protection of life and property. There are many towns in California without building inspection departments and many structures have been erected which stand by the grace of God and the factor of safety. Such towns should be governed by a State building code. The purpose of a State building code is not to interfere with those cities which already have adequate building inspection departments, but to cooperate with them for the safe construction of buildings and to strengthen building ordinances in towns where such ordinances are inadequate. The code should be confined to broad general requirements of fire-protection, sanitation, and structural safety. Technical details should be avoided except where needed to give meaning to the general requirements. The aim of the code should be to specify results only, giving free rein to the originality of the architect and engineer to secure results by the most economical and efficient means. In drafting such a code, attempts shall be made to cover only the essential features of construction, such as will safeguard life and property. Such safeguarding will not be a burden to the public but a sound business investment. State building codes have been adopted in Pennsylvania, Ohio, and Wisconsin, and California should follow their example.

VIEW OF BUILDING AFTER ACCIDENT DESCRIBED IN TEXT

TOMMY returned from school in tears and nursing a black eye.

"I'll pay Billy Dobbs off for this in the morning!" he wailed to his mother.

"No, no," she cried. "You must return good for evil. I'll make you a nice jam tart, and you must take it to Billy and say: 'Mother says I must return good for evil, so here's a tart for you."

Tommy demurred, but finally consented. The next evening he returned in a worse plight and sobbed:

"I gave Billy the tart and told him what you said, and then he blacked my other eye, and says you're to send him another tart tomorrow."

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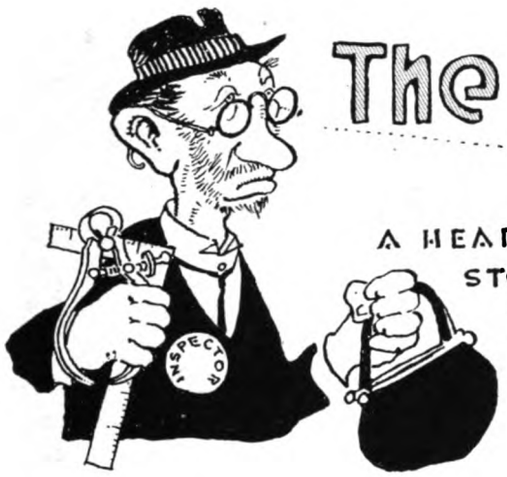


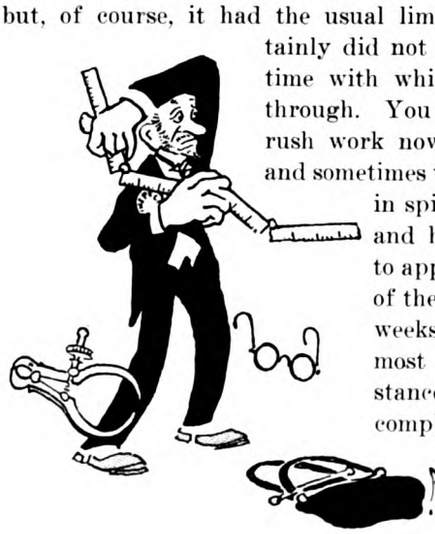
The INSPECTOR

A HEART INTEREST STORY BY THE GENERAL MANAGER HIMSELF

SPEAKING of inspectors," said the general manager the other day, after he had wasted three matches on a rather used-up cigar butt, "I think there ought to be legislative action of some kind, licensing these fellows, just as they do doctors, lawyers, and other people who make a living out of the efforts of the rest of us. We have just closed an experience with one of these birds, which, if it had lasted another 24 hours, would have put some of us in the asylum for life, and the rest of us in jail for manslaughter.

"One of the big foreign industries, producing a material vital to the conduct of the war, was in need of certain equipment. We knew how to make it, and as luck would have it, had practically all the materials on hand. Our reputation for the manufacture of this class of goods was such that the mine-owners placed an open order with us for the entire outfit, with the approval of the Government, which extended the usual priorities for material, fuel, etc., so that we could get the machinery out and ship it with the greatest possible dispatch. Every man in the place was keyed up to the necessity for making a quick, accurate job. We realized that in putting this through in record time, we would help to put a crimp in the Hun, and speed the day for the Wilson-made peace.

"An export license was obtained without difficulty, but, of course, it had the usual limitation, which certainly did not give any too much time with which to put the job through. You understand that rush work nowadays means two, and sometimes three, shifts. Well, in spite of all our efforts and hard work, we had to apply for an extension of the export license, two weeks longer under the most favorable circumstances being required to complete the job, and give everything a careful working test on the block to be sure that there could be no possible hitch after the apparatus left the shop.



"When the end was in sight a few days before completion, and everybody was getting ready to heave a real sigh of relief to think all difficulties had been overcome, and everything was about to be shipped, the purchaser wired that an inspector had been appointed to give everything the once-over before shipment. Within a short time the inspector arrived, and say! I wish you could have been there to see him. In he came, all rigged up with double lens eye-glasses, a stubble growth of hirsute adornment amplifying his inconsequential chin, and a black hand-bag, such as the ladies of the day use for transporting their toilet impedimenta. After a few preliminary words of introduction, Mr. Inspector-man opened the mysterious black bag, and dived to the bottom, emerging finally with a two-foot beautifully varnished, brand new, brass-bound folding pocket rule, such as the carpenter carries, in one hand, and in the other, an equally beautiful new pair of nice spring calipers. He had everything but Mills bombs and a gas mask. Armed with these weapons, and giving a furtive hitch to his trousers to see if they were still properly placed, he said, 'Lead on.' And 'lead on' we did. With a copy of the original specifications, which were strong for generalities and lacking in detail, he stood in grave and solemn contemplation of the completed apparatus, assembled and in place upon the erecting floor. Now, you know that machinery of this kind is not easy to measure under the best of circumstances. Accuracy within a half a thousandth of an inch is standard practice. Nevertheless, this twin-six inspector did not worry about a little thing like that. He sprung his calipers around the crank-shaft, measured the diameter with the accuracy to be expected from a two-foot carpenter rule, and solemnly announced that the crank-shaft was one inch too large. Explanations, however, served to mollify him somewhat upon the score that the engineering department determined that the proposed diameter of the shaft of the original specification was not large

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enough to assure sufficient stiffness and stability for the duty.

"The fly-wheel was not in place, and to this the Inspector next turned his attention with the assistance of the same handy pair of calipers and two-foot rule. He discovered that the bore of the fly-wheel was one-eight of an inch off. He cheered up a little, however, when he measured the bore a second time and came a little closer to the actual size of the hole.

"This two-foot rule and caliper-business as a means of checking work finished to micrometer dimensions where temperature conditions are taken into careful consideration, and the utmost skill is required to insure absolute accuracy, got my goat. It is all right to see the comedy in this sort of thing, but everybody around the place had worked so hard on this job that the whole crew were getting nearer and nearer the bursting point.

"Next, the Inspector-gentleman took a squint at the castings. This he managed through a method of his own, which consisted principally of the copious application of the pein-end of a machinist's hammer, manipulated with short, vicious strokes against the face of the suffering castings, looking like nothing so much in the world as a conversationist wood-pecker providing himself with a cold-storage plant against a long, hard winter.

"Behold! a spot was discovered upon one of the castings, where the mold had slightly fallen away, and the lump thus created had been chipped off. After squinting at this facial blemish for some time, the Inspector wanted to know with what sort of material the casting had been plugged. He stalked around the whole job, making copious notes of such things as sand-pits, and an occasional spot in the casting surface of some of the main pillow blocks. At these the Inspector expressed grave and solemn doubt as to the strength, durability and general fitness of castings that showed such horrible freckles.

"The foreman, who, by that time had joined the autopsy, explained that it was quite impossible to make the average run of iron casting without an occasional superficial blemish, which, although it might offend the artistic eye and the esthetic taste, could not affect its value from a utilitarian standpoint. In order to prove to the Inspector that this statement was true, the oil reservoirs of the pillow blocks were filled with water, and permitted to stand for sufficient time to show conclusively that the sand spots on the surface were no real indication of porosity in the castings. Well, no matter how good one's intentions, it takes more than two weeks to educate a man, especially when there is not much material in the first place to work upon. What do you suppose this fellow did? He rejected all of the pillow blocks and a number of the castings, not that he did not think they would work, but simply on the ground that he did not consider the castings first-class.

"You may imagine the situation. There was the plant, hungry for the machinery. There was Uncle Sam, hungry for the output of the plant. There was the steamer, ready to receive the goods, and here was this two-foot rule, spring-caliper inspector, who had gone over a lot of machinery with the same standards that he would use in selecting a candidate for queen in a May-day festival. There was only one thing to do for the sake of all concerned, and that was to get this fellow's scalp and nail it up on the barn door as quickly as possible. All work was stopped, and the telegraph wires were soon warmed up, believe me! We could not seem to beat it into the heads of the purchasers that we were not trying to put something over. We did everything possible. We begged, entreated, and cajoled. We asked for an umpire and we asked for any competent inspector, who even knew what a casting looked like, and offered to pay the cost of the additional inspection, and to replace all parts rejected by any competent umpire. Finally, we took a long chance, and retained an inspector whose competency and professional standing were beyond question. We forced the matter before the purchaser, who finally agreed to the appointment of a second inspector to check the first expert he sent out. The second inspector completely reversed the action of the first, and confirmed the opinion of our own inspector.

"And so it goes, competent labor must indeed be short, if this inspector may be regarded as a fair sample of what is going on in other shops. The net result was a big bill for lost time, another big bill for telegrams, another for extra inspection, a very sad experience for the firm who employed the original inspector. There is no use talking. There ought to be some protection for the manufacturer against this sort of thing. We make a doctor take out a license before he can cut us open and dope us with physic. We make an architect take out a license before he can build us a house to live in. A lawyer has got to behave himself, or the Bar Association will take steps to dis-bar him from practice, but yet there does not seem to be anything in the world to prevent an expert in hippology from providing himself with a two-foot rule, calipers, and double-lens glasses, sticking the sign "INSPECTOR" on his radiator, and running up every hill in the manufacturing district on high."

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The Development of the Sand-Cast Forging-Ingot

By W. L. Booth

Experiments carried on at the Oakland plant of the Judson Manufacturing Co. have produced a forging ingot up to Lloyd's and the American Bureau Standard and the equal of the Eastern ingots. In this article by the general manager of the Judson Manufacturing Co. a simple description of the open-hearth process is given and some of the causes of defective ingots are explained. The methods by which the pipe was lessened, and blow-holes and cracks largely eliminated are described.

THE Judson Manufacturing Co., of Oakland, was the pioneer in the successful manufacture of sand-cast forging-ingots on the Pacific Coast. Before the development of the present type, the only ingots made on this coast, besides those cast in a steel cylinder and commonly known as tin-can ingots, were some cylindrical sand-cast ingots made by the Llewellyn Iron Works. In order to develop a better type, the Pacific Coast Steel Co. and the Judson Manufacturing Co. jointly employed D. L. Johnson and C. E. Duncan to carry on the experiments, which have caused the development of the present satisfactory type of ingot. This is now being manufactured in large quantities by both companies. Before the Judson Manufacturing Co. succeeded in producing a satisfactory sand-cast forging-ingot, the U. S. Shipping Board planned to have the shafts for its ships made in the East. This would have meant that only the machine work would have been done in the West. These experiments have done much for the steel industry on the Pacific Coast.

To understand the problems entering into the production of sound ingots the following brief description of the open-hearth process is given. This process is essentially an oxidizing one, in which all the foreign elements in the iron are oxidized and absorbed by the slag or else driven off as gases. The oxygen for the removal of the impurities comes from the air passing through the furnace or from iron oxide introduced into the slag. Were the operation of the open-hearth furnace perfect, it would effect complete oxidation of all the impurities without oxidation of any of the iron. Unfortunately this is not possible because iron oxide in the slag is one of the chief carriers of oxygen and iron oxide is soluble in steel. Consequently, when the steel is ready to pour, it contains a considerable amount of dissolved iron oxide. Hydrogen and nitrogen are also absorbed to some extent. These gases and oxides must be removed from the steel before casting or they would form 'blow-holes' and other defects in the ingot. This purification is accomplished by the addition to the steel of alloys such as ferro-silicon and ferro-manganese. These melt and diffuse in the steel, combining with the oxygen to form insoluble compounds, which rise to the surface and enter the slag. Most of the nitrogen and hydrogen is eliminated with the insoluble compounds, leaving the steel comparatively pure. It is necessary that the steel be poured at a rather low temperature in order that the reactions may be completed in the ladle. If the steel is poured too hot, the reactions lag, and gas is liberated in the mold, forming gas-pockets in the ingot. Steel tapped at lower temperatures makes sounder ingots.

When the steel enters the ingot-mold, it first forms a solid surface-layer or skin, which, being in contact with the cooler walls of the mold, cools at a faster rate than the interior portion of the ingot and forms a solid shell that will not yield when the interior of the ingot cools and shrinks. In consequence, the contraction causes the molten steel to 'draw down' from the top, leaving a hole or pipe in the centre of the upper part of the ingot. In some of the steel-shell ingots, the pipe extends a third of the way down, and this must all be cut off and discarded. As the big ingots weigh 255 lb. for each inch of depth, this means a large loss of steel. The pipe is present in all ingots, and the experiments mentioned above were not directed toward its elimination, but rather toward lessening its size and depth. Some of the conditions favoring the formation of the pipe are hot steel, rapid pouring, rapid chilling of the surface of the ingot, unsuitable form of ingot, and improper chemical composition.

The advantage of sand-molds for large ingots is that the sand, having a low conductivity, does not permit rapid abstraction of heat from the skin, and thus the heat from the molten centre is conducted to the skin nearly as rapidly as it is radiated from the mold. In consequence, the entire mass of steel is at a more even temperature than when cast in any other kind of mold.

The shape of the ingot was found to be of great importance in minimizing the size of the pipe. When the ingots are cast in a cylindrical steel shell there is not only a rapid chilling of the skin, but also an unyielding form which, in the process of further cooling within the ingot, compels the shrinkage to be entirely in one direction, namely, outward, since the arc formed by the solidified metal is of great strength. A corrugation or 'valley',

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which always forms along these 'tin-can' or cylindrical ingots, is the result of the first contraction of the skin, which is able to move inward without resistance, the interior being still molten. The skin, however, has become attached to the steel cylinder. Since the cylinder is relatively cool at the moment of welding it cannot contract with the metal next to it and consequently folds inward. This of itself would not matter greatly, but it is well known that a 'valley' in any casting cools more slowly than a convex surface, so that the bottom of this 'valley' remains hotter than the remainder of the surface. Therefore, when the strain comes from within, it cracks because of its lower strength due to the higher temperatures and the fact that the structure had been disturbed.

The present type of ingot appeared to be one that would provide for the forces at work during cooling. It is octagonal in section, with the corners rounded and the faces depressed. This ingot first cools along the corners, the curved faces lagging somewhat behind. At the moment of pouring, the skin forms as usual and the ingot shrinks from the sand unresisted by the liquid interior. Later the inner portion contracts, and the skin, having been kept at a temperature not much below that of the interior, and particularly that of the depressed portions, is still soft enough to move inward on the face and prevent excessive piping. The advantage of the sand-mold to hold the heat during the action of solidifying is thus apparent.

POURING FROM LADLE TO SPECIALLY-CONSTRUCTED INGOT-MOLD

TWO OF THE COMPLETED 16-FT. INGOTS

FILLING LADLE FROM OPEN-HEARTH FURNACE

The ingots which are now being cast are 'bottom-poured,' although this method favors the lengthening of the pipe. Bottom-pouring is necessary on account of the great depth of the molds (16 ft.), since the steel falling that distance in deep pouring would splash badly and produce a great many shot surrounded by the liquid steel but not welded. These would later develop surface defects under the hammer.

The octagonal ingots shown in the illustration are 34 in. across, which is equivalent to a 30-in. square. The weight before cropping is 18¾ tons each. This type of ingot is remarkably free from pipe and other defects and is up to the standard of the best Eastern ingots. Out of a run of 50 made recently at the Judson plant, only 3 were rejected.

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Resources and Conversion Section of War Industries Board

THE newly organized Resources and Conversion Section of the War Industries Board is making a survey of the manufacturing industries of the country to determine the capacity of every plant for war work. Charles A. Otis, the chief of the Division, has divided the country into 20 regions. The States of California, Nevada, and most of Arizona constitute the 19th region. Frederick J. Koster is regional director. Mr. Koster has in turn divided this region into eight sub-regions, the San Francisco Bay counties being sub-region No. 1. W. T. Smith is chairman of this sub-region. Sub-region No. 1 is divided into four districts, San Francisco and San Mateo counties comprising district No. 1. G. C. Boardman is chairman of this district. The industries in each district have been organized. They have been divided into groups, a chairman elected for each group, and a representative for each industry. The object is to make available to the Government information regarding the industrial capacities of each section and to provide means for converting non-essential industries to war work. The organization will establish direct communication between the various purchasing departments of the Government and the merchants and manufacturers. Each industry selects its own representative on the Board, who secures for the organization the information regarding capacity, situation, etc., of all. The Government departments will send proposals to this organization, which will transmit them to the manufacturers that are best qualified to undertake the work. The organization will get the manufacturers and the Government representatives together, but will not send data in regard to specific firms, simply informing the Government of the additional capacity of the district for producing war material.

The industries have been divided into three groups, metals, products, and fabrics, as shown on the accompanying chart. In the second district, which comprises Alameda, Contra Costa, and Solano counties, the following appointments have been made in the metals group: R. H. Marchant, chairman, and George S. Drew, secretary. Electrical appliances, Walter Mittick. Machinery and machine-products, W. H. Oliver. Machinery supplies, O. A. Kenyon. Bar-metal, D. L. Johnson. Castings, H. C. Meanley, chairman, and D. Guild, secretary. Stampings and sheet-metal, W. F. Fairbairn, chairman, and A. Youngholm, secretary. Questionnaires have been sent to all manufacturers asking for complete information about organization, products, capacity, employees, and equipment. A detailed list of all tools is requested.

Charles A. Otis, in a letter of explanation, cites the experience in the Cleveland region, saying: "I think it is obvious to every business man in the country that the physical equipment of a shop is not as important as the personal element. In the Cleveland region, the manufacturers are developing new initiative and finding themselves by closer contact. Manufacturers have learned that many products are being made nearby of which they have been uninformed. Many benefits will come to us through regional organization as soon as we get together in this effort to win the War. These organized districts working with one another, cannot but be beneficial to the entire financial and industrial structure of the country."

Government Takes Steps to Provide Housing Accommodations for War Workers

TWO Government agencies, the U. S. Housing Corporation and the Emergency Fleet Corporation, are now engaged in efforts to meet the shortage of housing accomodations for employees in the war industries of the San Francisco Bay district, a shortage that is likely to become worse instead of better during the next few months, as many thousand workers are added to those now employed at the various plants. The U. S. Housing Corporation has opened offices at 203 Sharon Bdg., San Francisco, in charge of R. A. Petit. At the present time, its activities are divided into two parts; first, a survey of existing housing accomodations in all cities where plants of considerable size are engaged in war work, including San Diego, Long Beach, San Pedro, Portland, and the Puget Sound cities as well as the San Francisco Bay communities, and second, construction of new houses for employees at the navy yards at Mare Island, California, and Bremerton, Washington. So far, the Housing Corporation has taken no steps to build houses for other than navy-yard employees, nor is any such work under consideration.

The housing survey is under the general direction of Mark C. Cohn, formerly of the Commission of Immigration and Housing of Calfornia, who has been 'lent' to the Housing Corporation for this work. The survey will cover all possible accomodations in existing buildings, including vacant houses in good repair, vacant houses in bad repair, but which can be remodeled so as to make them habitable, and vacant rooms in occupied houses. The slogan of the survey is 'Help Uncle Sam by Housing the War Worker'. Not only will rooms that are ordi-

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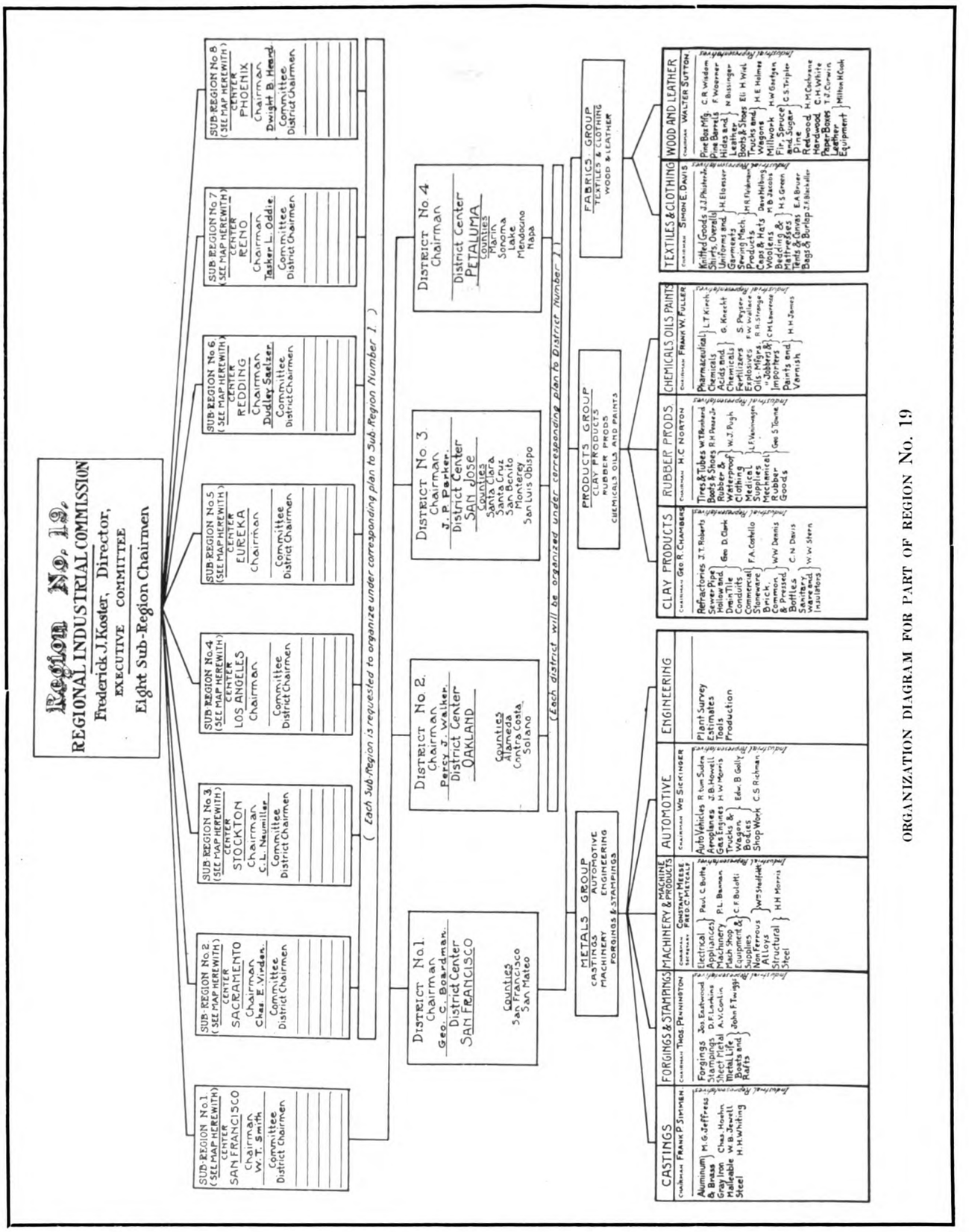

ORGANIZATION DIAGRAM FOR PART OF REGION No. 19

narily for rent be listed, but an attempt will be made to induce anyone that has an unused room in his house to rent it to a war worker. Where a member of the family is now at the front and his room is empty, the relatives will be asked to allow it to be used by a man that is making supplies for that soldier to use. An appeal will be made to the patriotic motives not only of owners of vacant rooms, but also of owners of buildings in poor condition, to induce them to make the necessary repairs. If such an appeal is not sufficient, it may become necessary to commandeer property, but such means will not be resorted to until all others fail.

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New Priority List Issued by War Industries Board

THE War Industries Board has issued the following preference list, superseding all previous lists and amendments. This list is primarily for the guidance of governmental agencies and all others interested in the production and supply of fuel and electric energy, the supply of labor, and the supply of transportation service.

The preference list comprises industries and plants that in the public interest are deemed entitled to preferential treatment. The inclusion of industries and plants on this list does not operate as an embargo against all others, but the effect is to defer the requirements of all other industries and plants until the requirements of those on the preference list shall have been satisfied.

In the compilation of this list, industries and plants have been divided according to their relative importance into four classes, viz: Class I, Class II, Class III, and Class IV. In determining such relative importance, consideration and weight have been given not solely to any one but to all of the following factors: (1) The intrinsic importance of the product itself for use during the War, and the urgency, as measured by time, of the demand or of the use to which it is to be put; (2) the necessity for maintaining or stimulating and increasing the total quantity of production, which in turn depends largely upon the relation of the supply to the demand for essential uses; (3) the proportion of the capacity of the industry or plant that is devoted to the production of the essential product.

Where it is imperative not only to maintain but to stimulate and increase production to satisfy abnormal demands created by war requirements, a high rating is necessary, even though the intrinsic importance of the product may be less than that of other products placed in a lower classification because the supply of such other products equals the demand without the stimulus of high priority. Where it is necessary to speed the production of a particular product required at a particular time to carry into effect an important program, a high priority is given, although changing conditions may thereafter suggest and demand a re-classification. Certain plants produce commodities of great relative importance, but at the same time produce other commodities of less relative importance, and under such circumstances consideration and weight is given to the ratio of production between the more important and less important commodities. Instances occasionally arise where individual plants are given preference so long as they are rendering, and so long as it is in the public interest that they should render, a particular service, even though, taking the country as a whole, the supply of their product is ample.

No distinction has been made between any of the industries or plants within any one class, and no significance attaches to the order in which industries and plants are listed within any class. The industries and plants grouped under Class I are such as are of exceptional importance in connection with the prosecution of the War. Their requirements must be fully satisfied in preference to those of the three remaining classes.

Requirements of industries and plants grouped under Class II, Class III, and Class IV shall have precedence over those not appearing on the preference list. As between these three classes, however, there shall be no complete or absolute preference. The division into classes is for the purpose of presenting a composite picture of the relative importance of the industries and plants embraced within each group. It is not intended that the requirements of Class II shall be fully satisfied before supplying any of the requirements of Class III, or that those of Class III shall be fully satisfied before supplying any of those of Class IV. Th eclassification does, however, indicate, that the industries and plants grouped in Class II are relatively more important than those in Class III, and that those in Class III are relatively more important than those in Class IV. It will often happen that after satisfying the requirements of Class I the remaining available supply will be less than the aggregate requirements of the other three classes, in which event such supply will be rationed to the industries and plants embraced within those classes. In determining a basis for such rationing the relative importance of each industry and plant, according to its class rating, must be considered. It has been found impracticable to prescribe for rationing purposes any general and uniform rule or formula, but the Priorities Board will from time to time, after conference, and in co-operation with each of the several governmental agencies charged with the distribution thereof, determine particular principles, values, and methods of application that may be followed in allocating fuel, power, transportation, and labor, respectively, to the end that proper recognition and weight may, as far as practicable in each case, be given to the relative importance of Class II, Class III, and Class IV.

Each plant listed as such shall not later than the 15th of each month file with the secretary of the Priorities Board, Washington, D. C., a report on P. L. Form No. 3 (a supply of which will be furnished on application) covering its activities during the preceding month. Any plant failing to file such report will be dropped from the preference list.

Priorities in the supply and distribution of raw materials, semi-finished products, and finished products

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shall be governed by Circular No. 4, issued by the Priorities Division of the War Industries Board under date of July 1, 1918, and all amendments and supplements thereto or substitutes therefor. The term 'principally' as used in listing industries shall be construed to mean plants whose output is not less than 75% of the products mentioned.

This preference list shall be amended or revised from time to time by action of the Priorities Board to meet changing conditions. The priorities commissioner shall, under the direction of and with the approval of the Priorities Board, certify additional classes of industries and also certify additional plants whose operations as a war measure entitle them to preference treatment, which industries and plants when so certified shall be automatically included in the preference list.

Classification of Industries

The industries, listed alphabetically and classified, follow:

Aircraft—Plants engaged principally in manufacturing aircraft or aircraft supplies and equipment I

Ammunition—Plants engaged principally in manufacturing same for the United States government and the Allies I

Army and Navy—Arsenals and navy yards..... I

Army and Navy—Cantonments and camps..... I

Arms (small)—Plants engaged principally in manufacturing same for the United States government and the Allies..... I

Bags (hemp, jute, and cotton)—Plants engaged principally in manufacturing same..... IV

Blast-furnaces (producing pig-iron) I

Boots and shoes—Plants engaged exclusively in manufacturing same IV

Brass and copper—Plants engaged principally in rolling and drawing copper, brass, and other copper alloys in the form of sheets, rods, wire, and tubes II

Chain—Plants engaged principally in manufacturing iron and steel chain..... III

Chemicals—Plants engaged principally in manufacturing chemicals for the production of military and naval explosives, ammunition, and aircraft, and use in chemical warfare..... I

Chemicals—Plants, not otherwise classified and listed, engaged principally in manufacturing chemicals IV

Coke—Plants engaged principally in producing metallurgical coke and by-products, including toluol I

Coke—Plants, not otherwise classified and listed, producing same II

Cotton—Plants engaged in the compression of cotton IV

Cranes—Plants engaged principally in manufacturing locomotive or traveling cranes..... II

Domestic consumers—Fuel and electric energy for residential consumption, including homes, apartment-houses, residential flats, restaurants, and hotels I

Domestic consumers—Fuel and electric energy not otherwise specifically listed III

Drugs (medicines and medicinal and surgical supplies)—Plants engaged principally in manufacturing same IV

Electrical equipment—Plants engaged principally in manufacturing same III

Explosives—Plants engaged principally in manufacturing same for military and naval purposes for the United States government and the Allies. I

Explosives—Plants, not otherwise classified or listed, engaged principally in manufacturing same III

Farm implements—Plants engaged principally in manufacturing agricultural implements and farm operating equipment..... IV

Feed—Plants engaged principally in preparing or manufacturing feed for live-stock and poultry.. I

Ferro-alloys—Plants engaged principally in producing ferro-chrome, ferro-manganese, ferro-molybdenum, ferro-silicon, ferro-tungsten, ferro-uranium, ferro-vanadium, and ferro-zirconium.. II

Fertilizers—Plants engaged principally in producing same IV

Fire-brick—Plants engaged principally in manufacturing same IV

Foods—Plants engaged principally in producing, milling, refining, preserving, refrigerating, wholesaling, or storing food for human consumption embraced within the following descriptions: All cereals and cereal products, meats, including poultry, fish, vegetables, fruit, sugar, syrups, glucose, butter, eggs, cheese, milk and cream, lard, lard compounds, oleomargarine and other substitutes for butter or lard, vegetable oils, beans, salt, coffee, baking-powder, soda, and yeast; also ammonia for refrigeration..... I

Foods—Plants engaged principally in producing, milling, preparing, refining, preserving, refrigerating, or storing food for human consumption not otherwise specifically listed. Excepting herefrom plants producing confectionery, soft drinks, and chewing-gum III

Food-containers—Plants engaged principally in manufacturing same IV

Foundries (iron)—Plants engaged principally in the manufacture of gray-iron and malleable-iron castings IV

Guns (large)—Plants engaged principally in manufacturing same for the United States government and the Allies..... I

Ice—Plants engaged principally in manufacturing same III

Insecticides and fungicides—Plants engaged principally in manufacturing same..... IV

Laundries IV

Machine-tools—Plants engaged principally in manufacturing same II

Mines—Coal I

Mines—Producing metals and ferro-alloy minerals. II

Mines—Plants engaged principally in manufacturing mining-tools or equipment..... III

Newspapers and periodicals—Plants engaged principally in printing newspapers or periodicals which are entered at the post-office as second-class mail matter..... IV

Oil and gas—Plants engaged principally in producing oil or natural gas for fuel, or for mechanical purposes, including refining or manufacturing oil for fuel or for mechanical purposes..... I

Oil and gas—Pipe-lines and pumping-stations engaged in transporting oil or natural gas..... I

Oil and gas—Plants engaged principally in manufacturing equipment or supplies for producing or transporting oil or natural gas, or for refining

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and manufacturing oil for fuel or for mechanical purposes III

PUBLIC INSTITUTIONS AND BUILDINGS (MAINTENANCE AND OPERATION OF)—Other than hospitals and sanitariums III

PUBLIC INSTITUTIONS AND BUILDINGS (MAINTENANCE AND OPERATION OF)—Used as hospital or sanitariums I

PUBLIC UTILITIES—Gas-plants producing toluol..... I

PUBLIC UTILITIES—Street-railways, electric-lighting, and power companies, gas-plants not otherwise classified, telephone and telegraph companies, and like general utilities..... II

PUBLIC UTILITIES—Plants engaged principally in manufacturing equipment for railways or other public utilities II

PULP AND PAPER—Plants engaged exclusively in manufacturing same IV

RAILWAYS—Operated by United States Railroad Administration I

RAILWAYS—Not operated by United States Railroad Administration (excluding those operated as plant facilities) II

SHIPS (MAINTENANCE AND OPERATION OF)—Excluding pleasure-craft not common carriers..... I

SHIPS—Plants engaged principally in building ships, excluding (*a*) pleasure-craft not common carriers, (*b*) ships not built for the United States government or the Allies nor under license from United States Shipping Board..... I

SOAP—Plants engaged principally in manufacturing same IV

STEEL-MAKING FURNACES—Plants engaged solely in manufacturing ingots and steel castings by the open-hearth, bessemer, crucible, or electric-furnace process, including blooming-mills, billet-mills, and slabbing-mills for same..... I

STEEL-PLATE MILLS I

STEEL-RAIL MILLS—Rolling rails, 50 or more pounds per yard II

STEEL—All plants operating steel-rolling and drawing mills, exclusive of those taking higher classification III

TANNERS—Plants engaged principally in tanning leather IV

TANNING—Plants engaged principally in manufacturing tanning extracts IV

TEXTILES—Plants engaged principally in manufacturing cotton textiles, including spinning, weaving, and finishing IV

TEXTILES—Plants engaged principally in manufacturing woolen textiles, including spinners, top-makers, and weavers IV

TEXTILES—Plants engaged principally in manufacturing cotton and woolen knit-goods..... IV

TEXTILES—Plants engaged principally in manufacturing textile machinery IV

TIN-PLATES—Plants engaged principally in manufacturing same III

TOBACCO—Only for preserving, drying, curing, packing and storing same—not for manufacturing and marketing IV

TOOLS—Plants engaged principally in manufacturing small or hand tools for working wood or metal III

TWINE (BINDER AND ROPE)—Plants engaged principally in manufacturing same..... IV

WAR AND NAVY DEPARTMENTS—Construction work conducted by either the War Department or the Navy Department of the United States in embarkation-ports, harbors, fortified places, flood-protection operations, docks, locks, channels, inland waterways, and in the maintenance and repair of same II

WIRE ROPE AND ROPE-WIRE—Plants engaged principally in manufacturing same..... II

? ? ?

"He has fainted!"

It was one of the historic moments in the history of the world. In order to raise enough money to carry on the gigantic war, the Ways and Means Committee, composed of the prepondering intellects of modern times, had now been sitting during the entire morning considering all of the possible methods by which taxes could be raised. Suddenly the chairman of the committee was seen to throw up his hands and collapse. Kind friends carried him to the open air. At last he opened his eyes. The new member, who had apparently been the cause of the collapse, had slunk away abashed.

"What did he say?" the great man was asked.

"You will scarcely believe it," he whispered hoarsely in reply, "but he actually had the audacity to suggest that the labor unions should be taxed in order to bear their share of the War.—Life.

The Three Graces

This group needs no introduction except to state that left to right we see Frank Baird of the Pacific, Billy Ward, and Ely Hutchinson, generally called 'Hutch' of the Pelton. It is rumored that 'Hutch' has developed a deflecting nozzle or some darn thing connected with an 'aich-two-oh' wheel that gives an efficiency of 103% by their own tables, and you can see Billy Ward looking sharp for customers.

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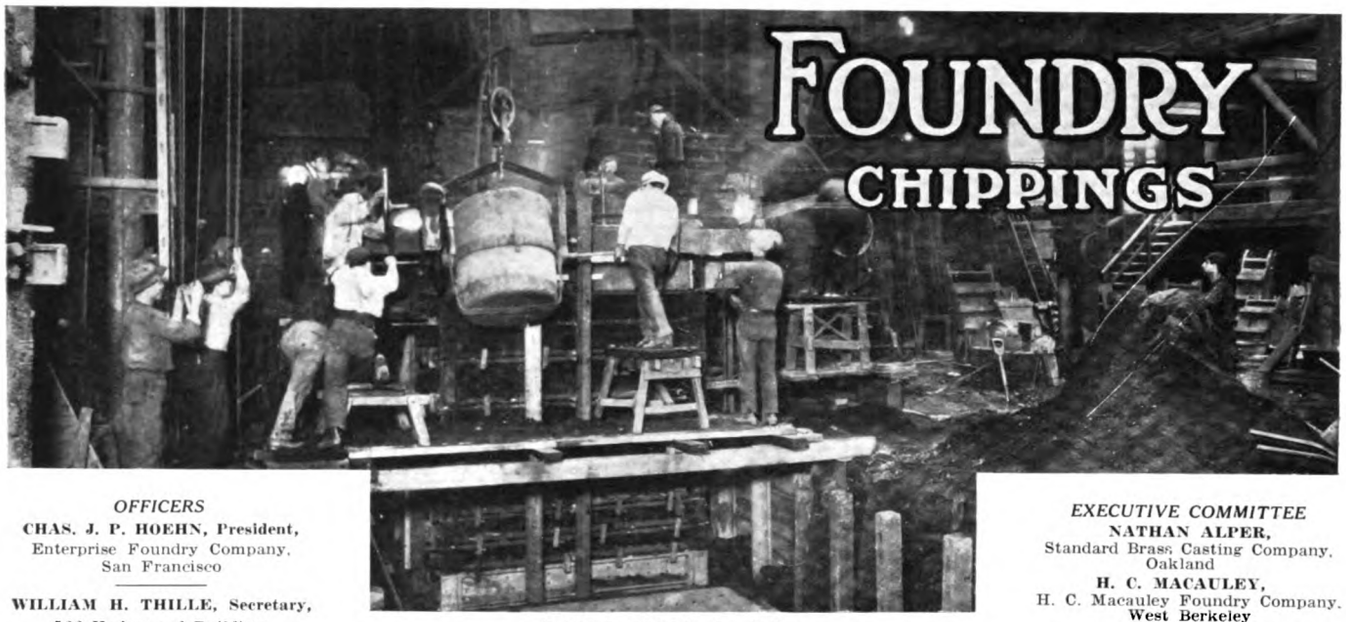

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CHIPPINGS

ABOUT eighteen months ago 'Chippings' was started as the official printed mouth-piece of the California Foundrymen's Association, and also of the Superintendents' and Foremen's Club affiliated with the Association.

Those who gave time and thought to the publication of 'Chippings' as well as it readers were more than repaid by the steady and rapid growth of the little publication and the enthusiasm with which it was received by all, but for several months past it has been evident to those having its welfare at heart that it must be enlarged and made to cover a wider field in order to carry out its policy.

'Chippings' has presented a little knowledge and a little fun, and has brought about a co-operative spirit among the foundries of the district as well as among the workmen and the shops. It cannot be denied that this has been a good tonic for all concerned.

It is fortunate that this same spirit has been taken up by 'Metal Trades' in promot-

(Continued on Page 412)

YOUR MONEY!

Why? What? When? How?

The First Liberty Loan drive was launched in May 1917 and 4,500,000 Americans bought the full allotment of $2,000,000,000.

The Second Liberty Loan drive was launched in October 1917 and 9,000,000 Americans bought $3,808,760,150.

The Third Liberty Loan drive was launched in April 1918 and 17,000,000 Americans bought over $4,000,000,000.

On September 28, 1918, the Fourth Liberty Loan drive started. Let everybody get behind it and push it over the top.

If 4,500,000 people bought bonds of the first issue, let us all work and make the Fourth Liberty Loan show that 30,000,000 have subscribed for more than the allotment.

LOAN AND GIVE TO THE UTMOST.
WHY? BECAUSE IT IS UP TO US.
WHAT? EVERYTHING.
WHEN? NOW.
HOW? TILL IT HURTS.

To do this, all will have to loan until it hurts, not till it hurts the way most people think when this phrase is mentioned, but till it hurts Kaiserism and the Potsdam gang, and hurts them to the death.

THE FOREMEN'S CLUB

AS an organization the Superintendents' and Foremen's Club of the California Foundrymen's Association has been a complete and unqualified success and particularly as shown by the increase of attendance at the monthly meetings from a start of eighteen or twenty up to two hundred and fifty. There is a reason for this interest which must not be lost sight of by the shop proprietors, and the reason is very simple because the club offers the foremen and the leading men a chance to get together and voice opinions which could never reach the office of the employer. The employers meet and discuss many matters of vital interest to the business, but if the foreman never hears of these conclusions and the employer never tells him about them, how can suitable results be accomplished?

Any employer will tell you that organization and interchange of ideas is a benefit to any trade, and the most highly organized business interests are keen to establish this in-

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terchange of ideas between all departments, so this plan is not a new one.

Within the last few years the employer has awakened to the fact that there were other matters of interest to the trade aside from the labor question, and he has been co-operating with his competitor as never before and to such an extent that the field opens up before him in a manner never thought of a few years ago. It used to take a strike to get the employers together but now they are getting together on matters of greater moment to the trade than any labor question.

The foreman represents one of the essential factors in the business and if this foreman co-operates with other foremen he certainly must be improved by the exchange of ideas just as the employer has been improved and with consequent benefit to the business and to the community as an industrial centre.

We must also consider the foreman to the extent that a means must be provided for the improvement of his skill as a foreman and his consequent advancement in the organization because he has learned all parts of the game. No man can compel or bring about any improvement which does not come from within himself and a good live foreman will welcome any plan which will put him in touch with advancement.

Then there are the leading journeyman and the workman; they are entitled to all the education they can get along the lines of perfecting themselves in their chosen trade. A man who becomes a careful and valuable workman is in line for a foremanship, or his work in common with many others will produce a line of goods which will attract trade to the district and to the shop in which he is working and compensate him by increased wages, position, or steady employment in dull times, to say nothing of the advantage of meeting foremen by whom he may be employed at some future date. The Foremen's Club has nothing to do with labor matters but it does provide a means of self education which no one interested in his chosen calling can afford to pass by.

We are passing through the melting-pot of industrialism and the time is coming when all hands must get together for the purpose of upholding our trade. This means only one thing, that the employer, the foreman, and the workman must all know their business thoroughly and it is probably safe to say that the time is not distant when definite conventions or meetings will be held regardless of capital or labor, at which matters of vital interest to the trade at large will be discussed and acted upon.

The Foremen's Club is the connecting link and should be fostered and encouraged for the good of the trade. It has only started, and many meetings could be improved but you must do your part to help it grow. Get behind it with your support be you employer, foreman, or journeyman. Carry on, and always remember that the employer needs it, because knowledge in his shop means growing business. The foreman needs it because he wants to be the best pebble on the beach and command more interest in his business organization. The journeyman needs it, because he wants to advance and insure steady work at good pay. We all need it, because it is progress, it is right, and it will put the Pacific Coast on the map as an industrial centre.

Chippings

(Continued from Page 411)

ing a high-grade trade journal, which will cover the trade in general for the district and the Pacific Coast, and which will bring about results for the metal trades as a whole, as 'Chippings' has for the foundry trade.

The same promoters, workers, writers, and admirers of 'Chippings' will be on the job and do their level best to keep it up to the mark, so do your best to boost it, and send items of news, articles, jokes, etc., particularly about the foundry trade, and throw down the gauntlet to the other trades in making 'Chippings' the best section of 'Metal Trades'.

OUR HAT IS IN THE RING, BOYS—CARRY ON.

The Alligator Pair

Our official photographer took 'em in Philadelphia in front of Independence Hall. Note the soulful expression on the 'phiz' of the left-hand conferee, he is wishing for some good old San Francisco fog. The right-hand conferee looks a lot happier than he really is, but he is thinking that some day the Employer may have the chance to sign a 'DECLARATION of INDEPENDENCE' and he hopes to be 'in on it.' The third conferee is the best likeness; he is taking the picture.

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Cupola Construction

IN the making of gray-iron castings the cupola is the most essential part of the foundry equipment. The design of the foundation depends on the character of the soil and the size of the cupola. The weight of the cupola and the weight of the coke and iron necessary to fill it to the charging-door must be considered. The legs of a cupola must be of sufficient length to allow for 10 to 12 in. of sand between the concrete base and the drop in order to keep the heat from cracking the concrete. The legs on a 48-in. cupola should be about 7 ft. high. This will permit the doors to swing clear of the drop and allow for a foot of sand on the foundation. The base-plate should be made of heavy cast-iron 2 to 2½ in. thick. Cast-iron is preferable to steel on account of the heat due to drop-iron getting into the tuyeres or from other causes. This would cause a steel base to warp out of shape and would make the cupola leak around the doors.

The shell of a 48-in. cupola should be made of $\frac{5}{16}$-in. plate below the charging-door and $\frac{3}{16}$-in. plate from the charging-door to the top. The wind-box should be of $\frac{3}{16}$-in. plate. Internal flanges made of angle-iron should be riveted at 5-ft. intervals to support the brick lining in case it is desired to renew a lower section. This wind-box, being only a receiving-tank, should be built large enough to receive the volume of air from the blower without placing it under pressure.

A space 9 in. wide and 5 in. high should be left between the shell of the cupola and the shell of the wind-box. The wind-pipe should have the same diameter as the outlet on the blower and should lead into the wind-box at the top to facilitate an even distribution of air. Two cleaning-doors and peep-holes opposite the tuyeres should be cut in the wind-box. These holes answer two purposes. They permit the cupola-man to clean away any slag that may block the tuyere-area and also to release the wind-pressure if it becomes too great.

Iron is melted with from 10 to 14 oz. blast-pressure. The height of the tuyeres depends on the amount of iron wanted at the tap. In stove-shops the tuyeres are placed low. Shops that want a 1500 to 2000-lb. tap have the tuyeres about 16 in. above the sand-bed.

The tuyeres on a 48-in. cupola should be 5 by 11 in. With six tuyeres, this would give approximately one square inch of tuyere-area to five of cupola-area. This is considered a good ratio. Tuyeres are measured at the shell of the cupola. The diameter then increases in order to give a continuous distribution of air around the cupola. Tuyeres are made long and narrow to prevent the coke from rolling into the wind-box. It is advisable to place one of the tuyeres on each side of the slag-hole and about 2 in. below and at right angles to it. A hole about 2 in. square should be drilled in the base-plate under the low tuyeres. The inside of the wind-box may be lined with a layer of clay around the bottom and tapered to the holes. A piece of thick cardboard or thin piece of wood or lead may be used to cover this hole. If the slag-hole should become plugged, permitting the slag and iron to run into the wind-box, it would either burn or melt the cover of this hole and the molten material would run on the floor instead of filling the wind-box. The slag-hole should be four or five inches below the tuyeres.

The slag-hole should be placed under the high tuyere in order to keep the cold blast from chilling the slag. A brick should be placed inside the continuous tuyere near the slag-hole to prevent the air from reaching the slag directly over the slag-hole. A hole about 2½ in. diam. in the shell is large enough for the slag-hole. The charging-door should be about 16 ft. above the base of the cupola and should be large enough to enable two men to handle a heavy piece of iron at the door when charging. For a 48-in. cupola, the door should be 4 ft. high and 5 ft. wide. The door should be made in halves and swing on hinges at both ends. A heavy cast-iron plate is placed at the bottom of the door-opening to give the man that is charging a place to rest his iron before placing it inside the cupola.

Bricking-up of the cupola is important as a cupola with brick that are not set tight will be short-lived. In the foundries around San Francisco, fire-brick is used exclusively. In bricking-up, use a brick on edge with the 4 by 8 in. side against the shell as far as the top of the charging-door, and a brick on end with the 2 by 8 in. side facing the centre of the cupola as far as the same point. This will give a double wall of fire-brick to the

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top of the charging-door. A brick on end with the 2 by 8 in. side against the shell will be sufficient from the top of the charging-door to the top of the cupola. When placing the brick around the tuyeres a cast-iron frame should be inserted at the tuyere-openings to prevent variation in the size from day to day. This frame can be flared to give it the continuous-tuyere effect. The top of the frame should project an inch or so to support a row of brick over the top of the tuyeres. This keeps the slag and iron from the tuyeres.

"I GAVE the waiter an order and he struck."

"Why was that?"

"He said that while labor was so scarce he didn't have to take orders from anybody."

"MRS. SMITH says she made her husband."

"Yes, she made a goat out of him."

The Inspectors

One of our foundries has developed a type of 'drinking fountain' for giraffes, and we see here the inspection of the first shipment consigned to the 'Giraffe Aid Society,' Obolumpa, Africa. This wonderful appliance is filled with water and a device is cast integrally with the fountain at bottom of casting so that the water will stay in the fountain. The water continues to stay there, and when the giraffe comes along all he has to do it to kick over the fountain and lap up the water as it runs out.

The Committee on Ways and Means

By C. M. Henderson

ABOUT the middle of 1916, when prices on all kinds of material as well as wages in the foundry business began to flutter helplessly, it became apparent to the foundrymen that the inconsistency in estimates submitted by them was causing them to be the laughing stock of the metal industry. While this seemed to be something that each foundryman could handle best in his own way no real study of the situation was made, or corrective measures devised until a Foundrymen's Ways and Means Committee was appointed. With the assistance of a cost expert it did not take long to find the trouble, which was simply that estimates were being given with costs based either on work of different character or in some cases simply on guess-work. It made no difference what estimates were submitted, the lowest was invariably accepted as being correct, nor was all the business going to any one foundry.

After careful study of the conditions, the committee undertook what at first seemed a fruitless task, namely, to devise a simple, practical, and universal method of estimating and checking costs, applicable to foundries only. This work required much searching of records. These were finally compiled, and the figures brought up-to-date to agree with present conditions. The result was a hand-me-down ready-to-wear vest-pocket cost-card that any foundryman who knows what a day's work is, or should be, can use readily either for estimating or for finding costs on work already completed.

These cards were not adopted immediately by everyone. The skeptical gave them the acid test, but in every such case the investigator either found the cards satisfactory and adopted them forthwith or else attempted at once to determine the cause of any discrepancy. The cards are now in general use throughout the State. For the credit of the Committee it might be stated that a similar committee from the American Foundrymen's Association recommended the adoption of a practically identical method a few months after it was put into use here, neither committee being aware the other was working on the subject.

SPEAKING of traveling. Isn't this some quartet to send to Philadelphia to bring home the game. Armes, Gunn, Fischer, and Fowler.

At Butler's orders we have doused the glim,
And darkened are the streets we wander in;
But we should worry not one little bit
About the streets while we can still get lit.

WHAT are you striking for now," said the boss; "we just gave you a raise."

"We want shorter hours this time. We need more time to spend the extra money you just gave us."

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"Ye Ken at Times a Man Maun Think o' Things"

By James W. Kerr

SINCE the last issue of the paper that records the thoughts and doings of the foundry fraternity we have met at the banquet-table to welcome back the representative whom we sent to the torrid East to present our ideas on the labor situation to the Adjustment Board at Philadelphia. It was proper that such a recognition for services rendered should have been given to Mr. Fowler, on his return from performing the duties imposed upon him.

In referring to Mr. Fowler's trip East, I purposely speak of his having been sent by us, and of his duties as having been imposed upon him. Our membership should understand that the work of the Association done in their behalf is not performed without much labor, effort, and self-sacrifice at times. I refer particularly to the work of Mr. Fowler as a case in point. When the Labor Adjustment Board called for a representative from this Association at their conference, your Executive Committee, realizing the importance of the work to be done, had but one thought, namely, to make the best representation possible. When I suggested Mr. Fowler's name, at a meeting held for the purpose of discussing the question, I was told that his services were not available, that he had just returned from an extended trip, and could not now retrace his steps, particularly since a large accumulation of unfinished business was awaiting him here, and his name was therefore to be considered out of the question. Some minds will yield to pressure, some to persuasion, others only to the cold logic of facts. At the meeting it was recalled that the agreement to be considered in Philadelphia was the one which Mr. Fowler had a hand in making; that the men who would pass judgment on this occasion were the men he had met, and whose acquaintance he had formed during the course of the many prolonged meetings leading up to the agreement under which we are now operating; that the knowledge and experience gained at these meetings would be invaluable at this time, and could not be transferred to another. When these facts and many more were presented, the mind, which would not bend to pressure or persuasion, at last yielded, realizing the injury that might befall us should he fail on this occasion. With reluctance Mr. Fowler obeyed orders and took up the responsibilities the occasion demanded.

In the course of his address, which occupied an hour and a half of our banquet evening, we were all impressed with the fact that our case had been well presented to the Adjustment Board. I make this statement about the work of our representative because I feel that I was in large measure instrumental in overcoming the objections of Mr. Fowler, and started him on an Eastern trip when the hot weather made the journey unusually unpleasant. I will not attempt to discuss the report that was presented to us fully at the banquet-table. That is now before a Board, whose decision we await with some curiosity, and a great deal of patience. I would, however, draw attention to the remarks made by Mr. Fowler about his meetings with the Labor delegates and the evident desire on their part to discuss in a friendly and informal way matters pertaining to our mutual interests. I was much pleased to hear of this attitude of our Labor leaders.

There are large questions affecting the industries of the State, which are being pressed to the front by men of socialistic tendencies. Demands are being made for the enactment of legislation of such far-reaching importance that it seems almost incredible that such demands should be presented without an effort being made to come to an understanding on the part of those directly affected; namely the workers and employers engaged in the industries upon which great burdens are to be imposed.

A few years ago when the Compensation Act was first proposed, the attention of the Association was drawn to the desirability of joint action on the part of workers and employers, but difficulty was experienced in arousing interest on the part of employers. We are now confronted with the second step in such class legislation in the form of social or health insurance. We are frankly informed by the advocates of this measure that it will be followed by unemployment insurance, with still other schemes to follow.

At a time when German thought and German methods were more popular than they are today, that land was held up to us as an example in labor legislation; but in the light of today we may question if the policy of having the ruling or political class force the industrial element by legislation into classes, the one dependent upon the other, is the best policy for a pure democracy. The purpose of a legislative act may be good, but the plan of its application may be vicious, and we may apply that term to the form of legislation that is proposed to be imposed upon the industries of California today. There is a limit to the burdens that our industries can sustain without facing the alternative of either curtailing the operations or of reducing the standard of living of those engaged therein. The interests of workers and employers alike are threatened and the time is ripe for all those interested to get together to meet the common danger. The suggestion at the banquet is therefore most opportune. 'Let us get together.'

No Lycurgus, men do not carry canes to keep the dogs off. Nor do officers wear spurs to furnish work for the brass foundries, it is to keep their feet from sliding off the desk.

McAdoo discourages railway travel, and it is close to 100% discouraging, according to those who have had a dose of it.

The Potrero sage suggests that the foundries move to the Western Front; there is plenty of scrap over there.

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MR. CHAS. HOEHN,
PRESIDENT,
CALIFORNIA FOUNDRYMEN'S ASSOCIATION,
SAN FRANCISCO.

DEAR CHARLEY:

YOU'RE THE guy that
MADE ME go, and
WHAT I'M going to
DO TO you on
ACCOUNT OF it
SHOULDN'T BE printed.
YOU SEE, it's
LIKE THIS, Charley:
AFTER I had squared
IT AT home and
FISCHER AND I arrived
AT OMAHA it got
HOT AND sticky
AND EVERYTHING and
WE COULDN'T eat
OR TALK either, and
BELIEVE ME, Charley, when
FISCHER AND I can't
TALK OR eat either
IT'S FIERCE.
WE FINALLY reached
PHILLIE AND stopped
AT THE Bellevue
WHERE THE meeting was
ON THE roof.
AND THERE was
BILLY BURTON and
AL GUNN all
MOPPING THEIR brows
AND WONDERING when
THE FOG would
ROLL IN to
MAKE IT cool.
WELL, THERE were about
FIFTY LABOR men and
ABOUT THIRTY employers,
IF YOU include
THE SEATTLE bunch.
AND THEY were discussing
A GOOD many things
THAT WERE interesting,
BUT WE don't
RUN ACROSS them in
THE ALLIED shop.
SO WE were rather
OUT OF it, but
WE PUT in a letter
THAT STIRRED things
UP A LITTLE and
WHEN THE recommendations
WERE ALL in we
ADJOURNED TO Washington,
WHERE WE held some
CONFERENCES OF our own
AND MOVED around
A LITTLE and put
IN ANOTHER letter and
LET OUR case rest
WITH THE board.
AND ANYWAY, Charles,
THE WHOLE matter is
IN THE hands of the
WAR LABOR policies board
WHICH WILL also control
THE ALLIED shops.
THAT'S US, Charley,
WE'RE ALLIES.
THE WHOLE trouble
SEEMS TO be that
THE SEATTLE and
PORTLAND SHOPS have
BOOSTED THE wages
SO HIGH on the
THEORY THAT
EXCESSIVE WAGES would
PREVENT STRIKES, and
NOW THAT they are
HAVING MORE strikes
THAN WE are they
ARE TRYING to
MAKE THE board see
THAT THEIR plan is
ALL RIGHT and are
TRYING TO tell us that
THE WATER is fine and
WE HAD better all
COME IN so they
COULD RAISE the ante
AND START in
ALL OVER again, but
WE COULDN'T see it.
SO OF course we
DIDN'T HITCH very well
AND ALL we want
IS TO be left alone
ON THAT score.
YOU CAN tell the boys
THAT WASHINGTON
IS LOOKING fine
AND THEY are all
DOING GOOD work and
PITCHING IN down there.
IT CERTAINLY looks
AS THOUGH the
KAISER WAS licked.
AND SAY, Charley,
YOU OUGHT to see
WHAT THEY charge
FOR EATS down East.
OF COURSE a fellow
DOESN'T MIND a
CHARGE OF two dollars
FOR ONE half of
A BLUE cold chicken
WHEN IT'S on a
RICH ASSOCIATION like ours,
BUT IT swallows hard,
AND IF a fellow
DIDN'T HAVE to eat
AND COULD go
BARE HEADED and
SAVE HAT check tips
IT WOULDN'T cost much.
ANY WAY, Charley,
I'M BACK, and
THIS IS about
ALL THE report
YOU'LL GET unless
YOU WANT to go
BACK THERE yourself
AND SWELTER awhile.

A certain prominent Bay Cities foundryman made the remarkable statement one evening last week that he was crazy. As if that were something new. It is a well known fact that all foundrymen are crazy, or they would not be in the foundry game.

THE Potrero sage says that it is a poor substitute for getting over seas to get seas over.

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Book of a Thousand Excuses for All Persons Connected With the Foundry Trade

Chapter IX

Molder-Apprentice's Excuses for Learning the Foundry Trade

The first boy interviewed said that his mother put him in the molder's trade because he always was a dirty child, and this trade was right in his line.

Boy number two thought it was a case of making mud pies, same as when he was a kid, and getting paid for it.

Number three claimed it looked like such an easy trade to learn, just make a hole in the sand and put some iron in it.

Number four said his uncle was a molder, and he wanted to be a sport like him.

Number five said he started learning the trade because he wanted to be tough.

Number six said he wanted to learn to make cannon balls in case he ever went to war.

Number seven said his parents figured he wasn't much good for anything else, so they put him at molding as a last resort.

Number eight was raised in a foundry and couldn't help himself.

Number nine wanted to be an artist, so he took up the molding game.

Number ten had to get out and dig to help keep the wolf from the door.

Number eleven figured that the molding trade would not be much of a strain on his mind. (Guess he was off.)

Number twelve said that the name 'molder' appealed to him in that it suggested the molder's art.

There were many other excuses offered. The question should, however, have been put to all boys in this way. What is your excuse for not learning the molding trade? The molding trade, if given the proper thought and consideration by the apprentice and also by the journeyman, has wonderful possibilities. Some have said that the molder's trade requires only 'a strong back and a weak mind.' Far from it, the molder's trade will develop the very best that is in a man. Some of the qualifications for a first-class molder are as follows: A clear head and eye, a keen sense of judgment, good health, and an artistic touch, coupled with the ability of a genius.

Of course, boys, you will all want to be molders now, so get in your applications early.

Our next chapter will be the 10th:

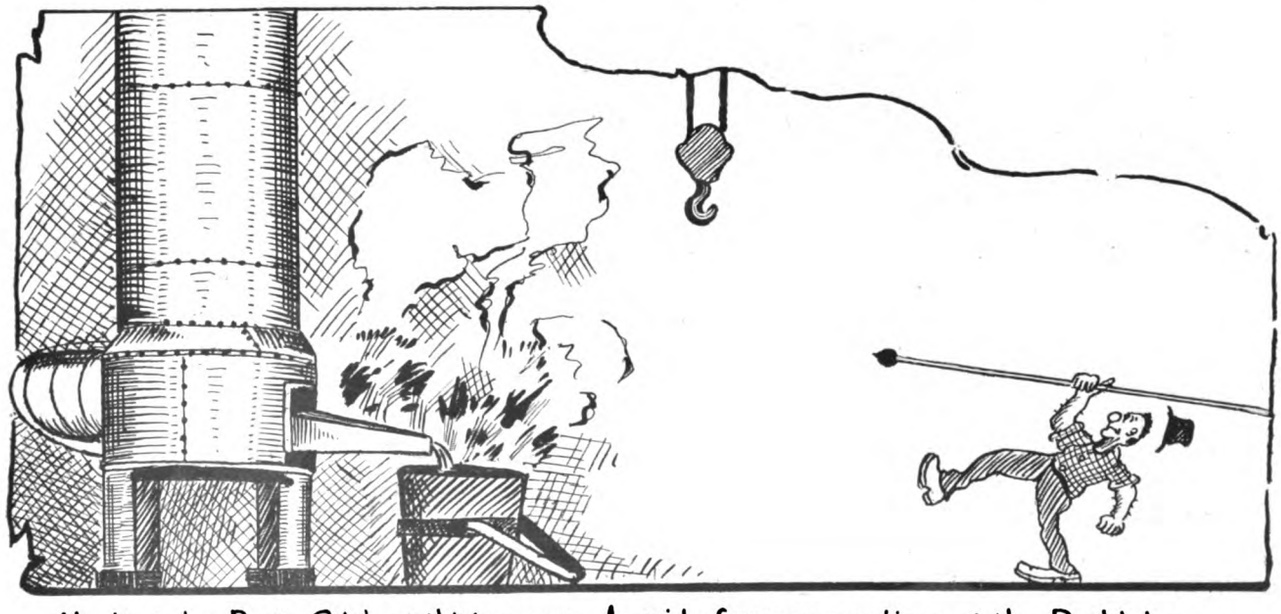
Machine-Bosses' Excuse for Constructing a Machine-Shop

This will be an opportunity for the machine-shop men to air their troubles. Come along with your excuses, boys.

Our foundrymen's representative on the scrap committee is 'on the job.' It is rumored that there was an auto smash-up in Oakland the other day, and while one policeman was 'phoning for an ambulance another one was putting in a hurry-up call for Henderson to get busy and divide the scrap before the dealers could hide it.

The New Orleans scrap is coming in, and some of the foundrymen who received a car are trying to use it and look pleasant at the same time. They say it's 'grate' scrap.

The 'Pacific' is now running an open shop, and it'll stay that way until the roofers start work.



Hurling the Bott-Stick at thirty paces. A mid-afernoon pastime at the Bethlehem.

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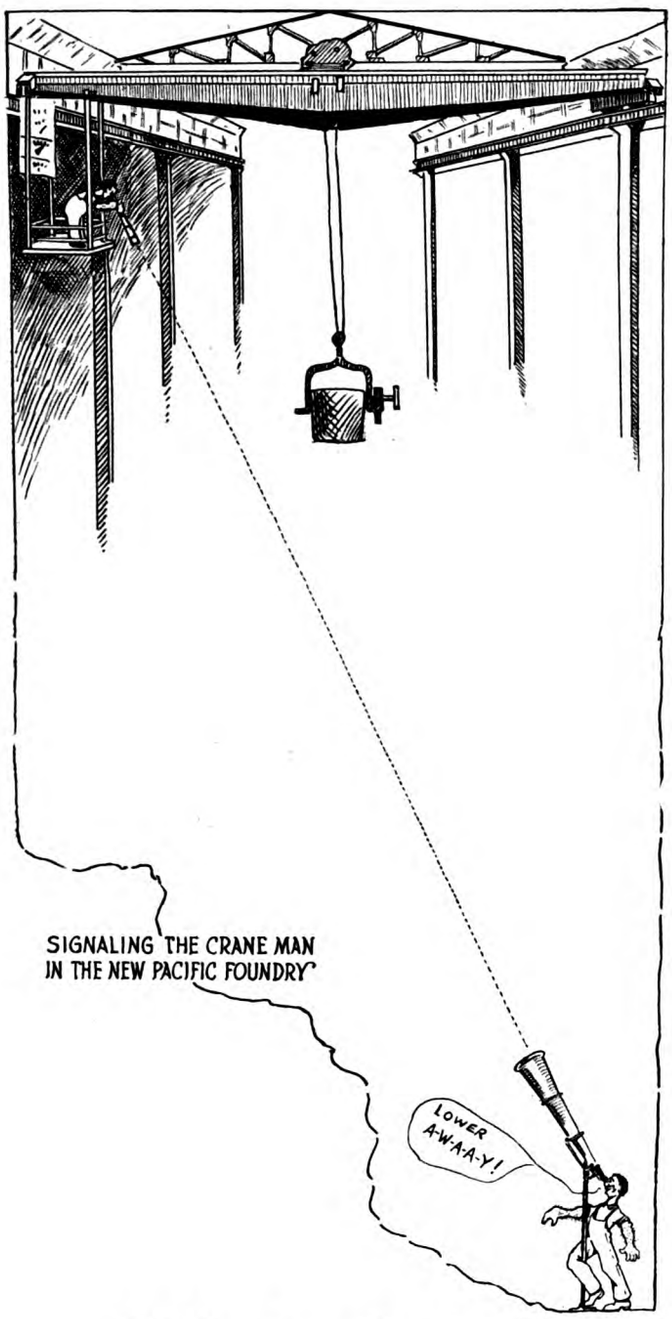

What is a Casting?

Webster says: That which has been cast or formed by running melted metal into a mold of any desired form.

A Boston foundryman says: A casting is a term erroneously permitted by custom to denote a solid form of various metalloid entities in such molecular relation as to resemble a solid substance. It may be poured or formed in such shape as may be in juxtaposition to the idea of the originator.

A machinist says: It's a piece of hard iron full of sand and blow-holes, which caused the invention of that darned high-priced tool-steel.

A Coast foundryman says: It's a thing what's hell to make and impossible to sell.

A high-school girl says: I saw them make a casting in dad's shop the other day and its just the easiest thing. The men cover themselves with black talcum and then take a shovel and put a lot of sand in the cutest little frame and then they pound it with a potato-masher and open the frame and take out the patterns with the sweetest little hat-pin you ever saw. Then they put it on the floor and another black man comes along with a blasting-spoon full of red-hot iron and they pour it into a hole in the sand and it makes the loveliest sparks you ever saw, and dad says if they make a lot of them this year I can have a new hat, ain't that just grand.

A customer says: It's one of the liabilities of any business, a thing easy to order but hard to get, and if its a steel casting the less said the better.

A brass foundryman drops into poetry as follows:

Little drops of copper,
Lots and lots of zinc,
Make them tough and strong,
I don't think.

A pattern-maker says: It's a piece of cast-iron, steel, or brass that has a slight resemblance to the pattern it was made from.

A junk-man says: The castings and scraps are what make the world go round, and if it weren't for castings, Yom Kippur wouldn't be possible.

Meetings

The regular monthly meeting of the California Foundrymen's Association is on the third Thursday of each month at 11 a.m. The next meeting will be Thursday, October 17.

The Ways and Means Committee meets every Wednesday morning at 11 a.m. at the Association Headquarters. It is the desire of the Committee to co-operate with the Foundrymen to the fullest extent. If you have any commercial problems that you feel the Committee may be able to help you solve, or lend you some assistance, you are cordially invited to attend the meetings and present same. Also if you have any suggestions to make, or constructive ideas looking toward the standardization of the foundry industry, PASS THEM ON. It is only through such helpful co-operation that concrete results can be gained.

The Brass Founders of the Bay Cities meet the second Monday evening of each month at 8 p.m., in the Assembly Room of the Association.

The Superintendents' and Foremen's Club meets on the second Thursday evening of each month at 8 p.m. Notice of the meeting-place will be sent out by the secretary.

THE U. S. Department of Labor has just issued a book on 'The Mortality from Respiratory Diseases in Dusty Trades.' It is a dry subject.

THE foundry-supply man used to be regarded as a necessary evil, but now he is just regarded.

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INDUSTRIAL EQUIPMENT

CALOL CUTTING COMPOUND

Calol is the name of a new cutting compound that the Standard Oil Company has just placed upon the market. An illustrated booklet has been issued describing it which also gives several useful tables of cutting-speeds, screw-threads, etc.

Any journeyman knows that the cutting-speed of most

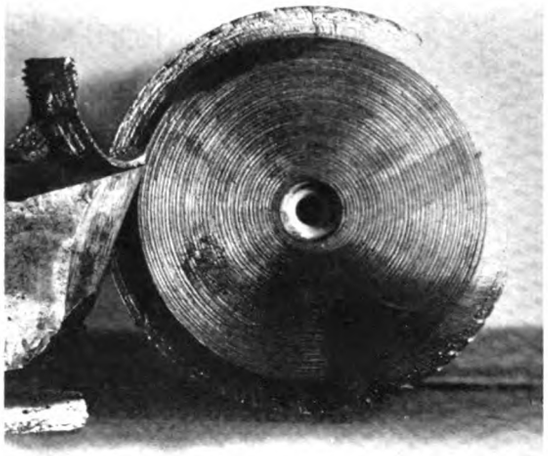

Fig. 1. Lathe-Tool in Operation

tools can be increased by the use of lubricating and cooling agents. Until the last few years every shop had its own formula. Pure water, soda and water, soap and water, as well as some complicated mixtures were employed.

The Standard Oil Co. found that lubricants alone did not

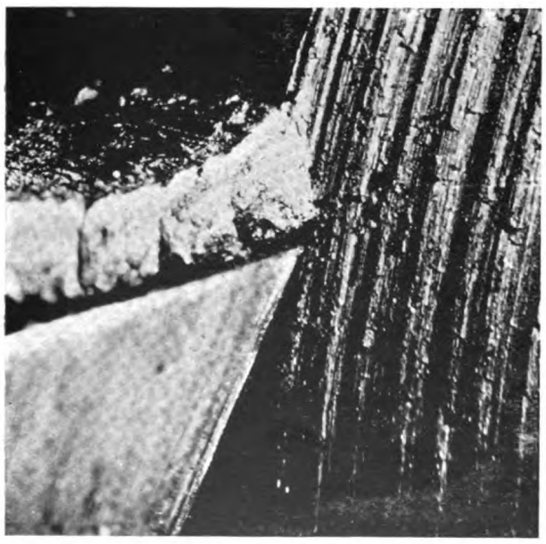

Fig. 2. Magnified View of Lathe-Tool in Operation

fully accomplish the desired object, besides being too expensive to be used in profusion. It was found that a cutting-compound must combine lubricating value with cooling value. Water is the most valuable cooling-agent, but water by itself does not lubricate, and furthermore, tends to rust the work. It has been known for some time that oils which emulsify with water give fairly good results as cutting-compounds when mixed with various proportions of water. Calol cutting-compound as developed by the company is an oil which will emulsify easily with water. It is intended as a cooling agent and lubricant for all kinds of cutting operations.

In connection with the same investigation, microphotographs were taken of cutting-tools while actually at work. The exact manner in which the lubricant reaches both the extreme point of the cutting-tool and the upper side of the cutting-tool was determined. These photographs also showed that the cutting-compound really reaches these points.

An outline of the statements and conclusions follows:

The true action of a cutting-tool has been a matter of much speculation. Experience has shown that for the best results the tool must be ground in a certain way and operated in a certain position, as illustrated in Fig. 1.

Fig. 3. Under Side of Steel Chip

The cut must be run slowly enough to allow the heat to be carried off by radiation, or else artificial cooling must be resorted to. Pure water rusts iron and gradually increases the temper of the tool until it breaks. Correct cutting-compounds do not increase the temper of the tool and do not rust the work. They also lubricate the tool so that less power is required and less heat developed.

Fig. 2 gives a microscopic view of the tool shown in Fig. 1, taken at the same time and in the same position. It will be noted that the metal is removed by first crushing it, then tearing or shearing, or 'prying' it from the main body of metal. The metal is crushed and bent outward until it can no longer stand the strain, whereupon it breaks, forming the crevices characteristic of the outside of the shaving.

The point of the tool is never in contact with the shaving. The cutting-compound flows down from the side of the shaving and into the crevice above the point of the tool.

A metal that gives short brittle chips, which do not slide down the top of the tool, requires practically no lubrication and little cooling, because most of the heat developed in crushing the chips is carried off by them. Metal giving long, tough chips requires both lubrication and cooling.

Fig. 3 shows the under-side of a steel chip. It illustrates

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clearly that the action of a cutting-tool is vibratory. The tool is first bent down slightly by the pressure of crushing a mass of iron crystals; then they split for a certain distance and the tool bends back. Calol cutting-compound enters during the splitting-period and lubricates the top of the tool

Fig. 4. Upper Side of Steel Chip

for the crushing-period that follows. The proportions to be used vary from four to fifteen parts of water to one of the compound, according to the class of the work.

On screw-machines, the turning-feeds generally used for tool-steel range from 0.008 to 0.032 in., depending on the grade of finish desired and the depth of cut. For forming and cutting-off, feeds from 0.001 to 0.01 in. are preferred. For roughing cast-iron, feeds from 0.032 to 0.062 in. are used.

MILLING AND DIVIDING-HEAD FOR LATHES

A new milling and dividing-head, devised by E. N. Moore, is being manufactured by the Eccles & Smith Co., of San Francisco. With this attachment an ordinary lathe can be used to do the work of a universal milling machine, a universal grinding machine, a high-speed lathe, and a dividing engine. Fig. 1 shows the milling attachment with overhead drive and dividing head. Fig. 2 shows the grinding and spacing attachments in place on the bed of the lathe. For dividing, the work may be held either between centres or in a chuck. The milling device can be attached to the lathe without any fitting. It is fed by the lead-screw feed by means of a belt-drive from the smallest head-stock cone to the lead-screw train. This arrangement is necessary because for some operations the centre or the chuck is held stationary while the carriage moves. The indexing-mechanism is geared 2 to 80, and uses standard dividing-plates. The gear is fitted over the sleeve of the chuck-plate hub. Change from chuck to face-plates is made by standardizing the hub and using studs through the chuck-plate, with a round extension to fit corresponding holes drilled in the worm-gear. A yoke and spindle supports the worm dividing-mechanism. A shank fits into a trunnion, and this is supported by bearings fixed to the front journal-box. The necessary changes of radius are provided to reach the proper length of arc through the work-gear, no matter how far it is from the spindle of the lathe. This mechanism is locked in position by tightening bolts on the ends of the trunnion-

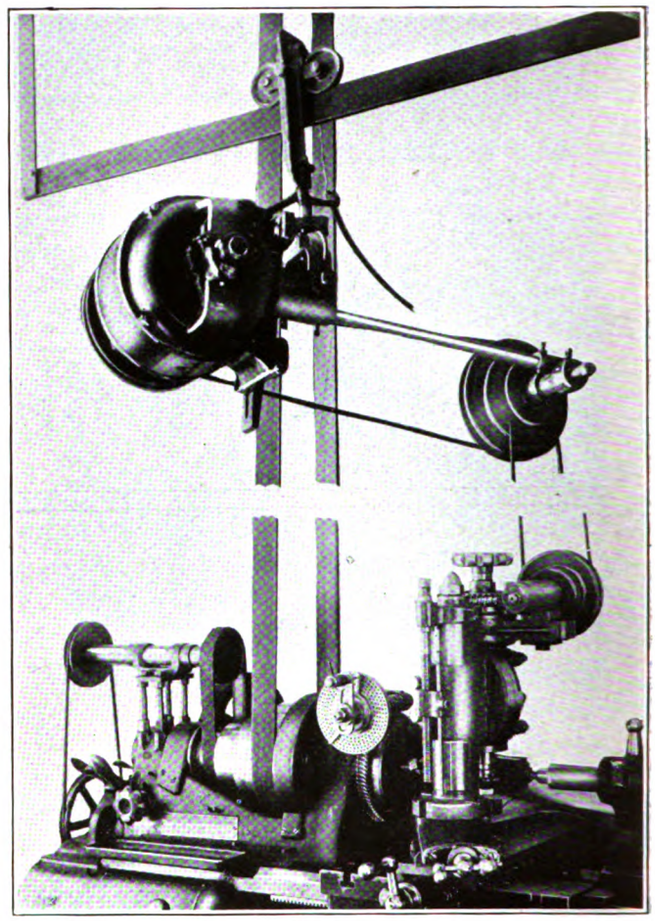

Fig. 1. Milling Attachment with Overhead Drive

bearing and a split sleeve holding the work-carrying spindle. It is possible to turn work on face-plates or between centres and divide and calibrate it without disturbing the original setting of the machine. A high-speed head for wood-turning

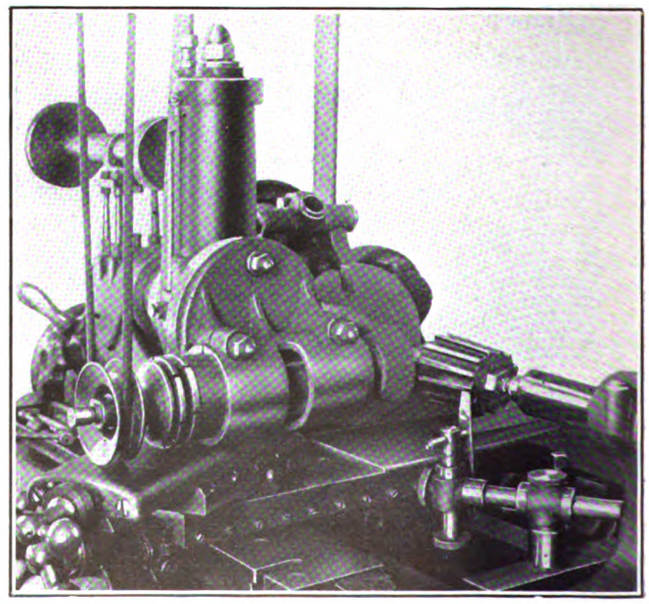

Fig. 2. Grinding and Spacing Attachments

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or pattern-work, to be screwed on the lathe-nose, is also furnished. As it derives its power from an independent source, it can be run at high speed while the lathe-spindle is running at low speed. In this way the wood-tool in the tool-post is given a machine-screw feed, while the two spindles are in motion at different speeds.

LARGE PROPELLER-ORDER RECENTLY COMPLETED

The Golden State & Miners Iron Works has just completed an order for 116 propeller-wheels for the Emergency Fleet Corporation. This is the largest single order ever given, and the contract was let only after guarantees had been made to complete the order in fast time. The contract was finished a number of days before the required time, and the propellers were shipped to many Pacific Coast yards where ships are being built. These propellers are 8 ft. 10 in. diam., with a 10 ft. 6 in. pitch. They weigh from 3600 to 3700 lb. per wheel. Special rigs were made for turning out this contract, and the wheels were cast, bored, planed, and key-seated at the rate of one wheel per day. For the casting of the propellers two pits were made. The holding down bolts were anchored in the bottom of the pit. There were four iron copes for each propeller. A pattern was made of one blade with double shrinkage, and the first propeller cast was then used as a pattern for the succeeding propellers. The copes and the iron pattern were all rigged so they could be handled by the crane.

A propeller was cast each day, while at the same time the machine-shop finished a propeller, so that the production was one completed propeller per day.

Some of the Propellers and Method of Casting

PNEUMATIC CALKER FOR WOODEN SHIPS

An inventive genius in Portland, Oregon, has perfected a pneumatic calker that will do as much work as five hand-calkers. With this machine, an operator and his helper can calk on an average 2300 ft. per shift. A record of 6300 ft. has been made. An average for a hand-calker is 450 ft. The 'gun' can be used to the greatest advantage on the decks and sides, as the oakum does not feed so well when the machine is operated up-side-down on the bottom of the ship. Either machine or hand-spun oakum is packed to any required depth by the calking gun but the 'horsing' has to be done by hand as before. The weight of the machine is 13½ lb. The air consumption is 20 cu. ft. of free air per minute, according to Ingersoll-Rand Co., the manufacturers.

NO-VOLTAGE RELEASE-ATTACHMENT

To prevent the scrapping of old starting-compensators for induction-motors that are not provided with the no-voltage release-feature, the Farnsworth Electrical Works, of San Francisco, have introduced an attachment which supplies the deficiency. This device converts the old-style compensators into a modern type. The use of such old-style compensators is no longer permitted in some States and municipalities. The starter-attachment is made so that the handle must be thrown to the starting-position before it can be thrown into the running-position. If released while in the running-position the handle is returned to the off-position by a spring. If the line-current is interrupted while the handle is in the running-position, the fall of the solenoid-plunger releases it and it is thrown to the off-position by the spring.

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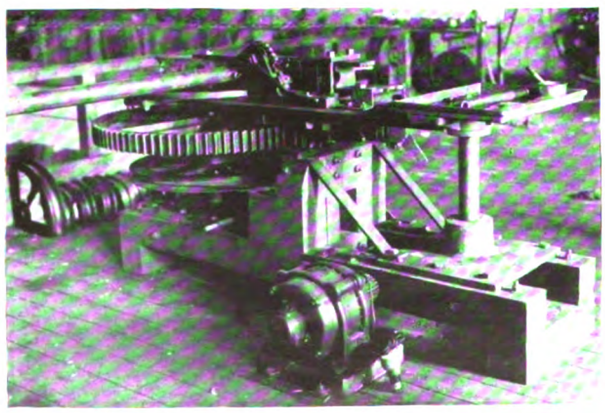
Movable Reamer in Use at Hanlon Yards

A HANDY MOVABLE REAMER

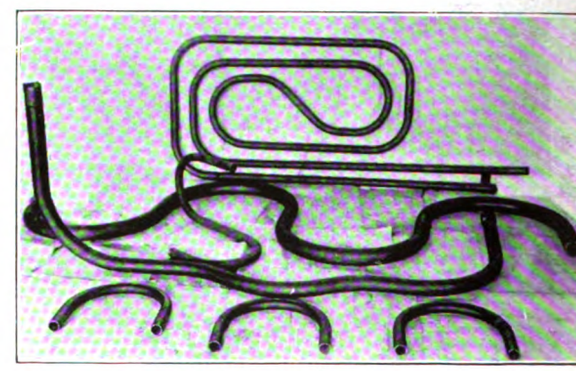
Mr. Hyfield, of the Hanlon Drydock & Shipbuilding Co., has devised a useful movable reamer, which has saved much time and trouble in carrying shapes to the shop. As shown in the illustration, this machine consists of a weighted carriage with a long handle so that sufficient pressure can be exerted on the tool. The drill is an Ingersoll-Rand 1-B non-reversible machine, 200 r.p.m. free speed.

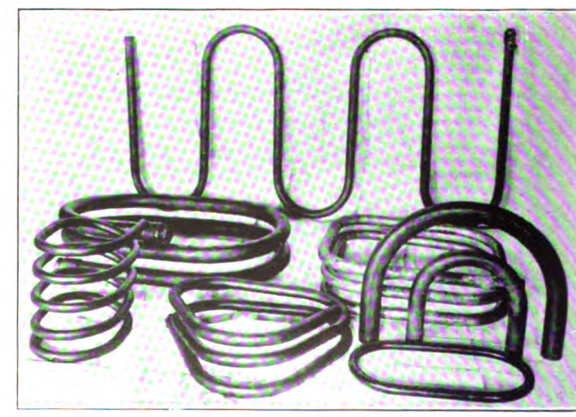
A NEW PIPE-BENDING MACHINE

The U. S. Shape & Pipe Bending Co., 315 Howard street, San Francisco, has perfected a motor-driven pipe-bending machine of unusual design. Machines of this type are now being used both in the construction of ships for the Emergency Fleet Corporation and on private work as well. The machines now being used will bend pipe up to 3 in. diam., cold. The work done by these machines has been so satisfactory that a machine has been constructed that will bend



Pipe-Bending Machine with Motor





Pipe Bent in Machine. Largest is 2½ in. Diam.

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6 in. pipe cold and 8 in. pipe hot. These machines make bends true to form and measurement. Furthermore the work is done rapidly, and pipe can be cut and threaded before bending. The position of the weld makes no difference. Standard pipe bent by these machines has stood a hydrostatic pressure of 1800 lb. per square inch without failure.

The machine for bending 3-in. pipe occupies a 6 by 10 ft. floor-space and is 40 in. high. The weight is a little over two tons. It is self-contained and can be carried from place to place on the work wherever needed, or even lowered into the hold of a vessel. This makes it particularly useful in shipbuilding. The large amount of pipe work required in tank-steamers can be handled conveniently with these machines. They can also be used effectively in refrigerating work. Iron pipes bent by these machines can be used in a great many places where copper pipe was formerly considered necessary. However, copper pipe can also be bent in these machines.

The U. S. Shape & Pipe Bending Co. was organized recently by P. B. Wallace and F. H. Fox, both former employees of the Moore Shipbuilding Company.

TRADE NOTES

The plant of the California Iron Yards at South San Francisco is said to be the best equipped and most economically operated scrap-yard in this country. W. H. McDaniel, president of the company, visited and studied most of the big yards of the East before commencing construction. He states that the cost of handling scrap will be less than half that of any other yard in the West. The yard covers six acres of ground and is designed and equipped to handle 500 tons of scrap daily. The equipment consists of a 150-ton Fairbanks track scale; a derrick for unloading heavy material; a derrick for unloading and breaking cast-iron; a Brownhoist electric locomotive-crane for unloading scrap, and a gantry-crane of 120-ft. span for removing cut material from the shears to the prepared scrap-space or for loading the out-bound cars. All material is unloaded and loaded with Cutler-Hammer electro-magnets. The in-bound and out-bound tracks will each accommodate 15 standard railroad cars at a time. The tracks are sunk to a depth of about 8 ft., so that the tops of gondola cars will be level with the ground-surface of the yard, thus allowing the man who is loading or unloading material to see the contents of the car. The construction work and the installation of the apparatus was done under the supervision of Fred W. Johnson, industrial engineer, who is now in charge of the plant.

From Left to Right: Unloading Car on Sunken Track; Shearing Scrap; Sorting Scrap with Electro-Magnet, Gantry-Crane in Background.

The Skandia-Pacific Oil Engine Co., of Oakland, is building a new 120 by 300-ft. machine-shop to facilitate the manufacture of 20 Diesel engines for the Emergency Fleet Corporation. These engines are known as the Werkspoor model and are of the full Diesel type. This is one of the most successful marine-Diesel engines designed by European manufacturers. The engines are to be 1100 indicated horsepower. Some very large tools will be required in their manufacture, including a rotary planer, a vertical planer, and a horizontal boring-mill. Some of these tools are to be mounted in a novel manner on a large cast-iron floor-plate, which will be arranged in such a way that the tools can be picked up by a crane and moved to any part of the shop if it is found advisable to move the tool to the work rather than the work to the tool. There will be one 30-ton and and 20-ton crane, together with several smaller electric cranes in the new shop.

The Alameda yard of the Bethlehem Shipbuilding Corporation won the pennant for second place in the July steelship yard competition of the U. S. Shipping Board. Five of the six pennants awarded came to the Pacific Coast. Skinner & Eddy's Yard No. 1, Seattle, Washington, took first place, and the Northwest Steel Co., Portland, Oregon, took third in the steel-ship yard class. In the wood-ship yard class, Grant-Smith-Porter Co., Aberdeen, Washington, took first place, and the same company's yards at Portland second place. Third place went to the Foundation Co., New Jersey.

The Atlas-Imperial Engine Co. of Oakland is building four 200-hp. Diesel engines for the Wm. Lyall Shipbuilding Co. of North Vancouver, B. C. These engines are said to be for ammunition-boats.

The American Engine Corporation has completed plans for a large Diesel-engine plant and will start construction as soon as it can get priorities for material and machinery. The plant will cost about one million dollars and will cover seven acres. The site will be between the Standard and the Atlas Gas Engine plants in Oakland.

The Wallace H. Dow Co. has completed the construction of a 45 by 137-ft. machine shop at 140 Howard street, San Francisco. Machinery is now being installed and it is expected that the plant will be in operation by October 1. General machine work and manufacture will be undertaken.

Barnes & Tibbetts have completed their new plant at the foot of Grand street, Alameda, with the exception of the drydocks. One of these will be operating in a month and piles are now being driven for the second. As soon as both docks are in operation the dock at the old plant at Alameda Point will be moved to the new site. The property comprises 18 acres and has a water frontage of a quarter of a mile. The

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equipment of shops, warehouse, and wharves is adequate for the complete outfitting of ships. Installation work for the Fleet Corporation on the wooden hulls that come loaded with lumber as tows from Washington and Oregon is the main activity at the plant.

The Pacific Foundry is erecting a steel shop-building extending from street to street over the old one at 18th and Harrison streets, San Francisco. The main building will be 52 by 245 ft. and there will be a lean-to or bay of saw-tooth construction next to it, 20 by 245 ft. This will also be of steel. Two handling cranes, built by the Cyclops Iron Works, one of 25 tons and the other of 30 tons capacity, have been installed. There will be three cupolas in the main building, the sizes being 54, 42, and 32 in. diam. inside the lining. A complete core-room with equipment and a new shipping department have also been added.

The Pacific Electro Metals Co. has equipment on hand at its plant at Bay Point for additions that will increase the capacity about 130%. J. W. Beckman, of the Beckman & Linden Engineering Corporation, consulting engineers for the company, states that the addition has been made necessary by the increased demand for ferro-manganese and silico-manganese, the products that are now being manufactured. Ferro-chrome, ferro-tungsten, and possibly ferro-vanadium will also be manufactured when the additional equipment is in operation.

The U. S. Shape & Pipe Bending Co. has completed a machine-shop at 315 Howard street, San Francisco, to manufacture its pipe-bending machines. An improved machine is now being made for one of the Bay shipyards, which will bend cold pipe 3 in. diam. and smaller. Another machine is being designed which will bend pipe from 3 in. up to 6 in. cold or 8 in. hot.

The Pacific Coast Boiler Works has moved into its new concrete building at 235 Main street, San Francisco. This is on the same site as the old building, which burned on May 22. The work has been carried on outdoors all summer. The contract for 84 tanks for Huff-type vessels has just about been completed.

The Standard Gas Engine Co., of Oakland, has spent between $150,000 and $200,000 on improvements of the plant this year. A new iron and brass foundry has been added. All engine parts, excepting forgings, are now being made at the plant.

The Hammond Lumber Co. has purchased the entire plant of the Marine Iron Works, of Eureka, and is moving the equipment to its own shops across Humboldt bay at Samoa. The Hammond company has the contract for equipping several ships for the Emergency Fleet Corporation.

The American Forge Co., 25 Tehama street, San Francisco, has ordered a 5000-lb. steam-hammer from Louis G. Henes, agent for the Erie Foundry Company.

New Publications

Synopsis of Proceedings of the 20th Annual Convention of the National Metal Trades Association. P. 103. Index.

This convention was held at New York during April 1918. Addresses were given on industrial development, employment of women, increasing the supply of skilled labor by training the unskilled, protection of plants from fire, and several other important topics. It is interesting to note that a committee appointed to investigate the subject reported that the adoption of the metric system in this country would be of little or no assistance in facilitating foreign trade.

The Pangborn Corporation, Hagerstown, Maryland, has issued an eight-page bulletin on 'Principles and Data of Sand-Blasting.' Two general methods are used in sand-blasting, the direct-pressure method, where the air and abrasive are combined in, and discharged from, a sealed container through a single nozzle, and the various systems where the abrasive is introduced into the air stream at or near the point of discharge. These systems are described briefly in the bulletin and some data regarding necessary compressor capacities are given. Dust-arresters are described and data are given regarding the kind of abrasive to select for various types of work, and also methods of ventilation where sand-blasting is done.

'Improvements in Water Wheel Efficiency' is the title of an interesting pamphlet being distributed by the Pelton Water Wheel Co., San Francisco, California. This pamphlet, fully illustrated with plant-views and diagrams, is based on studies made by E. C. Hutchinson, chief engineer for the company, and shows how increased efficiency may be obtained through improvements in water-wheel runners and water-economizing nozzles.

The Steel City Electric Co. has issued a 108-page illustrated catalogue describing the bushings, boxes, floor-outlets, and other electric fixtures manufactured by the company.

PYROMETER CATALOGUE

The Potentiometer System of Pyrometry and Temperature Control is the title of a 60-page 8 by 10½-in. catalogue published by the Leeds & Northrup Co., of Philadelphia, to describe a system of pyrometry and temperature control in which the potentiometer method is employed for measuring the electromotive force of the thermo-couples. The catalogue is well illustrated with pictures of the apparatus in use in various heat-treating and melting-furnaces. Indicators, recorders, temperature-control apparatus, thermo-couples, and optical pyrometers are described at length.

CATALOGUE OF WELDING AND CUTTING APPARATUS

The Bastian-Blessing Co. of Chicago has issued a 30-page catalogue describing its Rego cutting and welding apparatus, lead-burning equipment, regulators, etc. The booklet describes by text and illustration a complete line of welding apparatus and accessories. It is claimed that the 'flash-back,' the most annoying and costly habit of oxy-acetylene torches, has been eliminated.

Personal

James B. Smith, president of the King Coal Co., is making a survey of the coal-bunkering facilities at the various ports on the Pacific Coast, on behalf of the U. S. Shipping Board.

Emory E. Smith, Pacific Coast commissioner of scrap iron and steel for the American Iron and Steel Institute, has appointed the following advisory board for scrap metal in the San Francisco district: A. F. Pillsbury, C. O. G. Miller, J. Q. Brown, C. M. Henderson, H. H. Whiting, and W. H. McDaniel.

Guy E. Tripp, formerly Colonel in charge of the production division for the Ordnance Department, has been commissioned Brigadier General in charge of production of ordnance material. Previous to his connection with the Ordnance Department, General Tripp was chairman of the Board of Directors of the Westinghouse Electric & Manufacturing Co., with headquarters at New York.

W. T. Boyce, director of the United States Employment Service for the Western district, has appointed the following committee to assist in listing the essential industries and in the distribution of labor to them: Charles Day, representing the San Francisco Chamber of Commerce, O. H. Fischer, representing the California Metal Trades Association, Daniel C. Murphy, representing the State Federation of Labor, and Frank C. Miller, representing the Iron Trades Council.

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